FISHERIES RESEARCH BOARD OF CANADA

BULLETIN No. 155

FISHES OF THE ATLANTIC COAST OF CANADA

BY A. H. LEIM AND W. B. SCOTT

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FISHES OF THE ATLANTIC COAST OF CANADA

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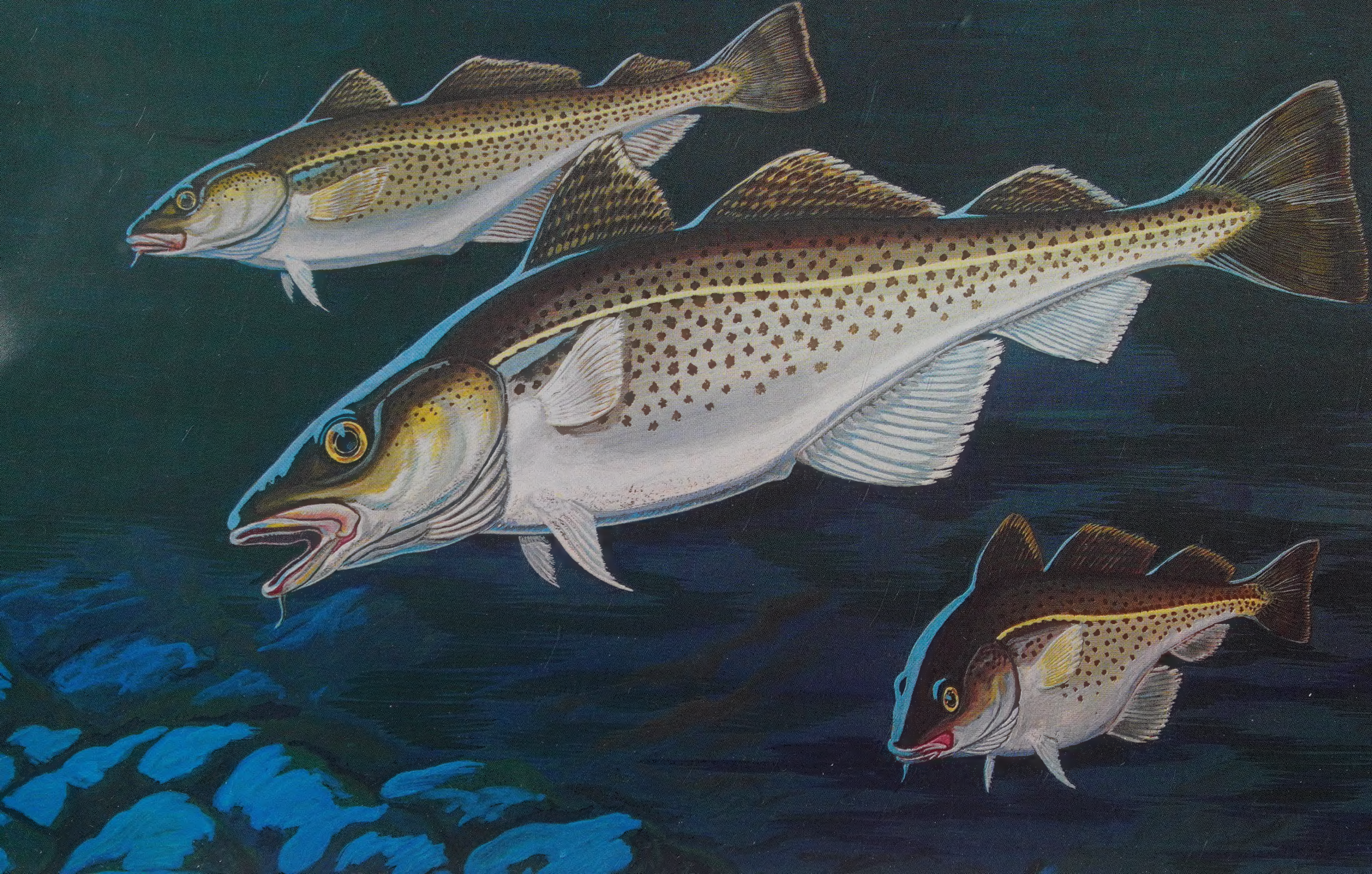

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Fishes of the Atlantic Coast of Canada

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By A. H. LEIM

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Ottawa, 1966

Frontispiece opposite: Atlantic cod, *Gadus morhua*

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FOREWORD

The need for a comprehensive authoritative book on Canadian Atlantic fishes has been recognized for many years. In 1956, Dr A. H. Leim began preparing such a book, drawing on his lifetime interest in the natural history of the region. At the time of his death in 1960, draft accounts of most species had been prepared. They supplied the basis on which Dr W. B. Scott, ichthyologist of the Royal Ontario Museum, has completed this volume. In doing so, Dr Scott has contributed the following: the introductory passages (exclusive of the section on Oceanography); all keys; the class, subclass, ordinal, and family accounts; abbreviated write-ups for approximately 50 species; the glossary; distributional maps and range statements for species of special interest; and supervision of the drawings. Some accounts, such as that for the sticklebacks, have been rewritten because of special interest and the availability of new information.

After careful consideration, it has been decided to publish the manuscript in its present state in order to provide a base for further research on the fishes of the area. Some lack of consistency of treatment for various species may be noted. This is a result of including species not among those originally described by Dr Leim. Some accounts may seem to be inconsistently brief. For many species this has been an unavoidable consequence of the limited state of knowledge.

It is hoped that an early revision of this work will be possible. Errors or omissions found in the following pages should, accordingly, be called to the attention of either Dr Scott, Royal Ontario Museum, Toronto, or the Director, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B.

Illustrations have been obtained from several sources. The United States National Museum, Smithsonian Institution, has made some of the famous Todd illustrations available as photographs or as originals through the good offices of Messrs L. W. Scattergood, G. W. Cains, and Dr A. C. Smith. Twenty-nine illustrations were completed by Todd and Stackhouse, commercial artists in Saint John, N.B. Most of the illustrations were done by Mr D. R. Harriott of St. Andrews, N.B. It has been a pleasure to associate with his conscientious competence.

Several institutions have cooperated generously by lending specimens for models or examination. They include: the Museum of Comparative Zoology of Harvard University, the Royal Ontario Museum, and the St. John's Biological Station of the Fisheries Research Board of Canada through its Director, Dr W. Templeman. Officers of the Department of Fisheries of Canada have sent in unusual specimens, and many fishermen and other individuals have shown their constructive interest by submitting rare fish for examination. Dr W. J. Dyer of the Fisheries Research Board's Technological Laboratory, Halifax, has been a very productive intermediary with the Halifax fishing fleet. Mr W. G. Carson, collector for the St. Andrews Station, has produced much interesting material for examination.

The advice of the late Drs J. R. Dymond and W. A. Clemens during the early stages of the project proved very helpful and is much appreciated.

The cooperation of the Royal Ontario Museum and of its Director, Dr W. E. Swinton, must be acknowledged for having allowed Dr W. B. Scott to divert his time to completing the volume. Finally acknowledgment should be made of the effective expediting of the project by Mr L. R. Day, who kept the work progressing in the face of many frustrations.

J. L. HART, *Director*
Fisheries Research Board of Canada
Biological Station, St. Andrews, N.B.

INTRODUCTION

This volume attempts the first step in filling the need for an authoritative reference book on the fishes taken off the twenty-one thousand miles of Canadian Atlantic coastline from Grand Manan to Cape Chidley. It attempts to include reference to all official records. However, despite much effort and full cooperation by many interested people, numerous matters of fact remain unresolved and the volume must be regarded as a base from which to expand and consolidate knowledge.

ACKNOWLEDGMENTS

The preparation of a work of this scope is only possible with the cooperation of many people. A complete list of all those who have contributed directly or indirectly is not possible. It is particularly regretted that the names of some whom Dr Leim would have undoubtedly acknowledged are unavailable.

The staff of the Board's Biological Station, St. Andrews, N.B., warrants special thanks. Every possible courtesy was extended whether at sea or ashore, although there must have been times when patience was nigh exhausted and especially so when strong formalin fumes pervaded the otherwise pleasant, salt-tanged atmosphere of the St. Andrews Station. Many members of the scientific staff contributed directly either by providing specimens, information, and advice, or by critically checking manuscript or drawings or both. Among these were: F. W. H. Beamish, L. R. Day, P. F. Elson, Y. M. L. Jean, C. J. Kerswill, A. C. Kohler, L. M. Lauzier, W. R. Martin, F. D. McCracken, R. A. McKenzie, J. C. Medcof, P. M. Powles, J. W. Saunders, R. L. Saunders, D. J. Scarratt, M. W. Smith, S. N. Tibbo, and D. G. Wilder. Special thanks are due to Mr Day for his valuable guidance and suggestions; to Dr Lauzier whose background in oceanography lent authority to the summary of the oceanography of the region; and to Dr J. L. Hart, Director of the Station, who encouraged and assisted in countless ways.

The ichthyological and other scientific staffs of many institutions have been of inestimable help by providing a variety of services. The National Museum of Canada, the Fisheries Research Board of Canada, Biological Station, St. John's, Newfoundland, the Museum of Comparative Zoology, and the United States National Museum have been particularly generous in making their collections available. It is a pleasure to acknowledge the assistance of the Board's station at St. John's; D. E. McAllister, National Museum of Canada; Julien Bergeron and Pierre Brunel, Station de Biologie Marine, Ministère de L'Industrie et du Commerce, Québec; Gerard Beaulieu, Quebec Department of Fisheries; N. G. Gray, Canada Department of Mines and Technical Surveys; P. H. Greenwood and G. Palmer, British

Museum (Natural History); Henry B. Bigelow, Giles W. Mead, and Mrs. Myvanwy Dick, Museum of Comparative Zoology, Harvard University; W. C. Schroeder, Frank J. Mather III, and Richard H. Backus, Woods Hole Oceanographic Institution; L. P. Schultz, E. A. Lachner, G. A. F. Garrick, and R. H. Gibbs, United States National Museum; E. C. Raney, Cornell University; D. R. Robins and D. de Sylva, Marine Laboratory, University of Miami; J. Bohlke, Academy of Natural Sciences of Philadelphia; R. M. Bailey and R. R. Miller, Museum of Zoology, University of Michigan; the late Mrs Marion Grey and L. P. Woods, Chicago Natural History Museum; Leslie W. Scattergood, Daniel M. Cohen, B. B. Collette, United States Bureau of Commercial Fisheries; R. Bolin, Hopkins Marine Station; and E. J. Crossman, Royal Ontario Museum, whose critical comments on many aspects of the manuscript are sincerely appreciated. Mrs. Isobel Radforth prepared a key to the genera of lanternfishes, family Myctophidae, and is deserving of special thanks.

Special thanks are offered to Mr Vianney Legendre of the Ministère du Tourisme, de la Chasse, et de la Pêche, Québec, for his cooperation in setting up a complete listing of French common names for the various species of Atlantic fishes.

Sincere appreciation is extended to Mr D. R. Harriott who skilfully prepared most of the drawings. Detailed credits for all illustrations will be found at the back of this book.

The assistance provided by the technical and clerical staff of the St. Andrews Station and by the captains and crews of the Station's vessels has been great and varied, but it is not feasible to mention all who have assisted. Special acknowledgment must, however, be made of the excellent photographic and drafting service provided by Mr P. W. G. McMullon.

And last, but not least, there is Mrs Milly Scott, to whom sincere thanks are extended for her typing, critical reading, and bibliographic service.

HISTORICAL REVIEW

Notwithstanding de Loture's[113]* remarks concerning the possible activities of the Vikings in the Newfoundland region nearly 1000 years ago, the credit for the discovery of the Atlantic coastal area of Canada is usually accorded to John Cabot as a result of his voyage in 1497. Cabot's stories of the abundance of cod were in part responsible for fishing vessels from England, France, Spain, and Portugal working the rich fishing banks off Newfoundland. But, generally speaking, detailed accounts of the fishes themselves did not appear until the 19th century.

In his account entitled *A history of ichthyology in Canada*, Dymond[128] remarks that "The scientific study of ichthyology in Canada may be said to have commenced with the work of Richardson who accompanied Franklin as surgeon and naturalist on his first (1819–1822) and second (1825–1826) expeditions in search of the northwest passage." This statement seems as applicable to Canada's Atlantic coastal waters as to the waters of the northwest where Richardson had greater first-hand knowledge. Richardson's[384] account of 1836, *Fauna Boreali-Americana*, included at least 27 recognizable species then known to occur off the Canadian Atlantic coast and, for some of these, descriptions were given in considerable detail. Many of these accounts have been overlooked, unfortunately, in modern publications. In addition, Richardson's book included a number of marine species that were known to occur in the waters off Greenland or Iceland and also off the east coast of the United States; some of these fishes are now known to occur off the Canadian Atlantic coast.

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* These superior numbers used throughout this book refer to the complete reference similarly numbered in the References section starting on p. 436.

Following the publication of Richardson's work many years were to elapse before a comparable account would be available for the Canadian region, although many accounts treating the marine fishes of the United States waters appeared. DeKay's[112] *Fishes of New York* which appeared in 1842 was one of the earlier comprehensive publications. In the Canadian area the writings of Moses H. Perley, particularly those of 1850–1859 are worthy of special notice. His report upon *The Fisheries of the Bay of Fundy*,[346] published in 1850, and *Reports on the sea and river fisheries of New Brunswick*,[348] published in Fredericton, N.B., in 1852, marked a high point for the literature of the east coast fisheries. His writings were often quoted and sometimes shamelessly plagiarized.[425] Perley's writings dealt with the habits and life history of the fishes utilized in the commercial fishery. He did not discuss the taxonomic or morphometric characteristics of these fishes.

Horatio Robinson Storer is another early worker whose writings are of special significance. Storer[455] wrote an account, which was published in 1850 in the Boston Journal of Natural History, of a journey he made in 1849 to the Gulf of St. Lawrence, and in particular to Cape Breton, Anticosti Island, and the Strait of Belle Isle. Storer's account embraced 29 species and for many of these a detailed morphometric description of the species was given, including colour notes, fin ray counts, and tooth development.

Following Perley and Storer, came the contributions of Bell, Gilpin, and Fortin. In 1859 Robert Bell,[39] a geologist, published an account entitled *On the natural history of the Gulf of St. Lawrence and the distribution of Mollusca of eastern Canada*. This paper was the result of a trip made in 1857 and included accounts of about 27 species with interesting notes about some freshwater local names and Indian utilization of the fishes. From 1862 to 1868 J. B. Gilpin wrote a series of articles, which were published in the Proceedings and Transactions of the Nova Scotia Institute of Science, on the food fishes of Nova Scotia. The accounts of Pierre Fortin were perhaps more critical and therefore more useful. Fortin's[139] accounts were published in the Annual Reports of the Canadian Department of

Marine and Fisheries for the years 1862, 1863, and 1864, under the title *List of the Cetacea, fishes, Crustacea and Mollusca which now inhabit and have inhabited the Canadian shores of the Gulf of St. Lawrence.*

In 1865 there appeared Theodore Gill's[159a] work entitled *Synopsis of the fishes of the Gulf of St. Lawrence and Bay of Fundy*. Gill presented keys to orders and families of fishes because of ". . . the absence of facilities for the ready identification of some of the species." Gill's synopsis covered 92 species, a large list for the period, and it included freshwater as well as marine forms. Gill stated that his synopsis was based on the observations of Richardson, Storer, Dawson, Jones, Perley, Fortin, and Bell. The validity of many species was questioned by Gill, but other records, especially many by Storer, were accepted, although proof of their occurrence in our area is still lacking.

T. F. Knight published two reports on the fishes of Nova Scotia that should be mentioned, the first of these was entitled *Descriptive catalogue of the fishes of Nova Scotia* (1866)[246] and the second *Shore and deep sea fisheries of Nova Scotia* (1867).[247] In the catalogue Knight remarked that he was ". . . largely indebted to the late Mr Perley's excellent catalogue. . . ." for the descriptions of the fishes, their haunts, etc., but that the material was ". . . rewritten, much condensed and a more systematic arrangement of the material attempted." The author noted that some additions were made to Perley's list but the catalogue refers to only 44 marine species.

In the Proceedings of the Nova Scotia Institute of Science have appeared many articles dealing with the Atlantic fish fauna. One of the earliest of these was a paper by J. Matthew Jones[232] entitled *List of the fishes of Nova Scotia*, published in 1882. Jones noted that his list was ". . . corrected to date 1879 and that the list comprises all the fishes recorded to date as occurring in our waters." In the short introduction Jones noted that he received much help from his esteemed friend Professor G. Brown Goode of the Smithsonian Institution. Jones' list was annotated and under each of the 97 species listed was a short statement concerning occurrence and relative abundance of the species under consideration.

The Reverend D. Honeyman, a curator in the Nova Scotia Museum of Natural Science, published new records of marine fishes in 1885 and 1886, although most of Dr Honeyman's writings were concerned with geological subjects, particularly glacial geology of Nova Scotia.

Toward the close of the 19th century appeared two publications that would seem to have answered, for all time, the need for ichthyological reference material. The first of these to be completed was *Oceanic ichthyology* by G. Brown Goode and Tarleton H. Bean,[170] dated 1895 but now considered to have been published[86] in 1896. The second was the four-volume work *The fishes of North and Middle America* (1896–1900) by David Starr Jordan and Barton W. Evermann.[234] Both of these monographic treatises, especially the latter one, have been extensively used by those requiring information on the Canadian fauna, even to the present day, the users often being unaware of the many changes made necessary by more recent knowledge.

Since 1900, many regional works and special studies have added greatly to our knowledge of the fishes of the general area. Dymond[128] provided further information, and particularly on the work and evolution of the Fisheries Research Board of Canada. Although space would not permit mention of all the regional works, the writings of the following authors warrant particular attention: Professor Philip Cox published many papers on marine fishes in the Bulletins of the Natural History Society of New Brunswick, in the Canadian Field-Naturalist, and in Contributions to Canadian Biology between 1893 and 1924. W. F. Ganong's[154] account of 1910 entitled *The identity of animals and plants mentioned by early voyageurs to eastern Canada and Newfoundland* was a most valuable summary for it brought together the observations of the early voyageurs up to the 18th century and included observations of at least 44 species. E. T. D. Chambers[77] prepared in 1912 an excellent historical account entitled *The fisheries of the Province of Quebec*, that contains a wealth of information on the personalities and circumstances of the development of the fisheries. Mr Harry Piers, Nova Scotia Museum of Science, wrote many papers that appeared in the Proceedings and Transactions of the Nova Scotia Institute of Science from 1888 to 1934. Andrew Halkett,[184] naturalist with the Department of Marine and Fisheries, published the *Checklist of the fishes of the Dominion of Canada and Newfoundland* in 1913, the first illustrated and all-inclusive list of Canadian fishes. Halkett wrote other accounts but the list was the most significant; in his introductory remarks he mentioned a number of contributors to knowledge of the Atlantic fishes. The contributions of V. D. Vladykov, formerly with the Quebec Department of Fisheries and now on the staff of the University of Ottawa, are numerous and significant. Especially useful was his 1935 publication *The marine fishes of Nova Scotia*,[513] written jointly with R. A. McKenzie. Other works by Vladykov include *Nouvelles espèces de Lycodes (Pisces, Zoarcidae) du Saint-Laurent et revision de toutes les espèces du même genre de l'Atlantique occidental*, with J. L. Tremblay.[515] The writings of A. G. Huntsman from 1917 to the present day have been widely used, particularly *The fishes of the Bay of Fundy*[205] and his numerous papers on Atlantic salmon. Of great importance also have been the reports of various Atlantic oceanographic expeditions, such as the Challenger Reports that did much to stimulate deep-sea work by other nations resulting in such excellent series as the Dana Reports, the Michael Sars Reports, and the Reports of the Galathea Expeditions.

In recent years the text on Atlantic fishes that has been most widely used by Canadians is the well known *Fishes of the Gulf of Maine*, which was written first by Henry B. Bigelow and W. W. Welch[55] and published in 1925, and revised by Bigelow and Wm. C. Schroeder[49] and re-published in 1953. The usefulness of this text can hardly be overemphasized but it went out of print a few years after the revision was published and has, unfortunately, been increasingly difficult to obtain, although a photo-offset reprint is now available.

The most recent treatise, however, on the fishes of the area is the monographic *Fishes of the Western North Atlantic*, published by the Sears Foundation for Marine Research, Yale University. This comprehensive and superbly prepared series will consist of many parts, three of which are at present available: Part One[47] covers the lancelets, cyclostomes, and sharks, Part Two[50] on the sawfishes, rays, and chimaeroids, and Part Three on the salmon, trouts, tarpon, etc.

The above is a cursory introduction to previous work on the fish and fisheries of Canada's east coast, and undoubtedly many worthy publications have been omitted. Some omissions were intentional; for example, the contributions of present staff members of the Fisheries Research Board of Canada have not been mentioned individually. Reference to these will, however, be found on almost every one of the pages to follow. Similarly, recent publications by United States and European workers will be referred to in appropriate species accounts.

OCEANOGRAPHY OF THE REGION

The continental shelf is wide off the Canadian Atlantic coast. The waters covering it are influenced by land drainage and two major ocean currents. The currents are the Labrador Current, which carries cold arctic water in a generally southerly direction, and the warm highly saline Gulf Stream flowing toward the northeast (Fig. 1). The region off the Canadian coast is one of considerable mixing of water types to form recognizable water masses. The mixing depends upon the volume and properties of the waters involved, upon the prevailing winds, and upon the tides.

In general, coastal areas have waters of low salinity. However, they have offshore components of high salinity waters and become less stable because of reduced vertical density gradients. Between the coastal waters off Nova Scotia and the Gulf Stream lies the slope water which arises from mixing Gulf Stream, Labrador Current, and coastal waters. It extends south of a sharp boundary in a broad band between the edge of the continental shelf and the Gulf Stream.

In particular four areas can be recognized. They are: the Labrador–Newfoundland–Grand Bank area, the Gulf of St. Lawrence, the Scotian Shelf, and the Bay of Fundy.[182]

LABRADOR–NEWFOUNDLAND–GRAND BANK AREA. The coastal waters off Labrador are influenced by the western (inshore) part of the Labrador Current which has a somewhat lower salinity and lower temperatures than the offshore part. As the inshore part flows south, it covers most of the Labrador–Newfoundland Shelf, penetrating deep inlets and other openings like the Strait of Belle Isle as well as the deep channel separating the Grand Bank from Newfoundland. By the time this

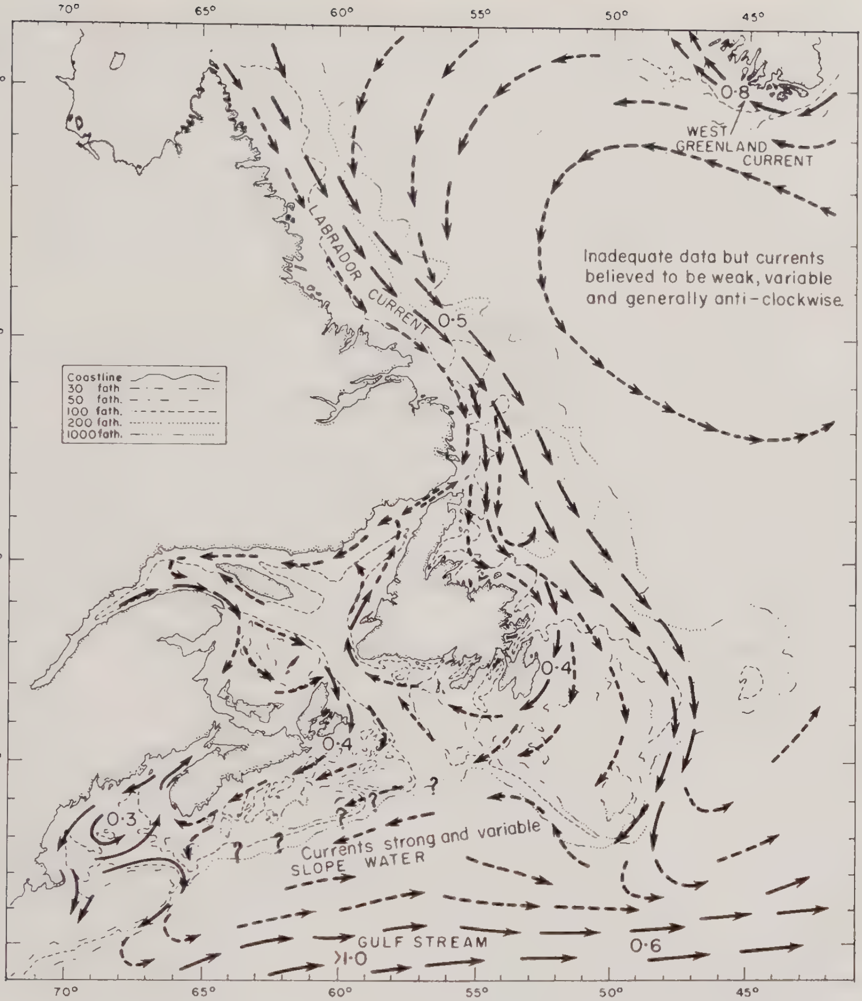

70°
65°
60°
55°
50°
45°
40°
Coastline
30 fath.
50 fath.
100 fath.
200 fath.
1000 fath.
LABRADOR CURRENT
0·5
0·8
WEST GREENLAND CURRENT
Inadequate data but currents believed to be weak, variable and generally anti-clockwise.
0·4
0·4
0·3
Currents strong and variable
SLOPE WATER
GULF STREAM
>1·0
0·6
?

FIG. 1. Chart of the Canadian Atlantic region showing current flow.

water reaches the Laurentian Channel west of St. Pierre Bank, its properties within the upper layers have been modified by mixing but it is still recognizable by its minimum temperature layer at intermediate depths. The Labrador Current flowing southward to some extent invades the Grand Bank with cold water but mostly it skirts the eastern edge of the Grand Bank rounding the "Tail" westward into the Scotian Shelf region.

The area between the southwestern edge of the Grand Bank and the Scotian Shelf is one of complicated mixing that plays a predominant role in the production of the bands of slope water between coastal waters and the Gulf Stream. The southwestern slope of the Grand Bank is subjected to incursions of slope water as warm as 10 C (50 F) and of relatively high salinity.

The cold subsurface waters of the inshore part of the Labrador Current may occupy a large proportion of the Labrador–Newfoundland Shelf. The distribution of this cold water, favourable to cod and their food, has a strong influence on the inshore fishery along the east coast of Newfoundland.[467] Templeman and Fleming[476] describe how warm-water layers near the surface and at depths on the east coast of Newfoundland in summer are divided by a cold intermediate layer which controls the distribution of cod by acting as a barrier to the movements of the larger fish.

The surface waters of the inshore branch of the Labrador Current off southeastern Newfoundland have an average winter minimum temperature of −0.9 C (30.4 F) and an average summer maximum above 12.0 C (53.6 F).

GULF OF ST. LAWRENCE. As the Gulf of St. Lawrence is an inland sea, its surface waters are subjected to extreme temperature conditions. It is a three-layer system in summer, and has two layers in winter. Conditions in the Gulf are dominated by the freshwater outflow of the St. Lawrence drainage basin, by the effects of weather, and by the inflow and outflow at various depths in the Strait of Belle Isle and in Cabot Strait.

A deep inward flow through Cabot Strait provides a deep layer of high-salinity water at temperatures higher than those of the cold-water layer. This deep warm layer in the Laurentian Channel does not show seasonal variations in temperature or salinity.[258, 260]

During the winter, the two-layer system consists of a thick cold layer overlying the deep warm water from Cabot Strait. In spring when surface waters warm up, a recognizable third layer appears above a sharp vertical temperature gradient (thermocline) while the cold layer persists at moderate depths producing a three-layer system. In autumn when the surface waters cool and mix with the cold layer, the two-layer system is restored.

The temperatures of the surface waters of the Gulf range seasonally from −1.7 C to 20.0 C (29–68 F) or more.[261] However, in some areas like that along the North Shore the range is much reduced.

Oscillations of the thermocline induced by external forces like winds cause large fluctuations of properties on and near the bottom water in some areas. This causes death or weakening among marine animals adapted to living in cool water.[119, 120, 256, 257]

The St. Lawrence watershed drains into the Gulf causing the brackish surface layer to flow toward the ocean while it picks up and mixes with more saline water from the subsurface layers. The result is that the amount of mixed water leaving the area is greater than the amount of fresh water entering. The balance is made up by an inflow of higher salinity water into the system which is partly in the form of an upstream counter current of deeper water along the bottom. Because counter currents of this kind carry sea water upstream, marine fishes are found on the bottom in the mouths of large rivers, such as the St. Lawrence and Miramichi.[63, 181, 362]

SCOTIAN SHELF. In summer the waters of the Scotian Shelf are strongly stratified in temperature and salinity, and may be readily described according to layers. The upper layer, which may be as much as 40 fathoms thick, has temperatures more than 5 C (41 F) and as high as 20 C (68 F). In general, salinities are reduced from open sea conditions. At the height of summer, stratification is particularly high. Inshore waters consist wholly of this upper layer. The thickness of the surface warm layer is changed by atmospheric disturbances with the result that there are extensive short-term variations in bottom temperatures. The intermediate layer, which varies between 17 and 80 fathoms in thickness, has temperatures less than 5 C (41 F) and as low as 0.0 C (32 F). The salinity is moderate. This water layer determines the water characteristics on most of the offshore banks. The bottom layer is between 50 and 110 fathoms. It is usually warmer than 5 C (41 F) and normally as high as 8 C (46.4 F). At times, incursions of slope water over the Scotian Shelf introduce bottom water as warm as 12 C (53.6 F). Waters in the bottom layer are rather highly saline.[182] The way in which the various water layers flood the fishing banks controls the occurrence and concentration of fish schools and thus the success of the fisheries.[208] Species composition of groundfish landings, for cod and haddock, seems to be related to the general level of water temperature.[317]

BAY OF FUNDY. Great tidal amplitudes arising from resonance in the Bay of Fundy and the resulting strong tidal currents are most important in influencing oceanographic conditions in the Bay. Vigorous mixing occurs at all times and seasonal changes are less than in other parts of the region.

General water movements throughout the Bay of Fundy are in an anticlockwise direction. The circulation may be "closed," or surface water may leave the Bay and be replaced by other coastal water at various depths. Near the bottom, the slope water may contribute one-quarter to one-half of the replacement water. The occurrence of "closed" or "open" circulation regimes and the eddies in the main system are important to the success or failure in survival of free-drifting larval animals.[118]

Because of strong mixing action, waters in Passamaquoddy Bay of the Bay of Fundy appear to be representative of a broad regime. Temperatures taken systematically over many years at St. Andrews show warming of water from the 1920s to a maximum around 1950, followed by what seems to be the start of a decline.[259] The northern occurrence of some marine species usually taken farther south is associated with warm water years.

CLASSIFICATION SYSTEM

The classification arrangement, including the names of classes, subclasses, orders, suborders, and families is essentially the same as that used in Bulletin No. 68, *Fishes of the Pacific Coast of Canada.*[82] With only minor exceptions this system of classification follows that proposed by C. Tate Regan, British Museum (Natural History). It was believed that use of the same system as that appearing in Bulletin No. 68 would facilitate comparison of the various Atlantic species with their Pacific counterparts and that familiarity with the system used in one book would be equally useful when using the other.

NOMENCLATURE

The nomenclature employed on the following pages in general follows North American practice. Cognizance has been taken of special studies and monographic works, and for the most part the recommendations made by the authors have been followed. However, in some cases, as for example Svetovidov's *Gadiformes*,[457] the changes in nomenclature were sufficiently great to cause considerable confusion to nonspecialists and hence were not adopted. *Gadus ogac* and *Molva byrkelange* are treated by Svetovidov[457] as subspecies and listed as *Gadus morhua ogac* and *Molva dipterygia dipterygia*, respectively. The use of subspecific designations (such as *Gadus morhua ogac*) in general seems inappropriate in dealing with the Canadian Atlantic fauna, since this fauna is really not well known systematically. Comparatively few systematic studies of its various fish species have been conducted and many of the nomenclature changes that have been applied have been a result of inference rather than direct observation.

There is also considerable inconsistency in the use of scientific names of many well-known species. While some disagreement is inevitable and desirable in scientific or academic discourse, frequent or drastic changes in names without adequate explanation in popular and semipopular works lead only to confusion and loss of confidence in the works themselves. One of the many examples of this point is the Atlantic sturgeon. The European or Northeast Atlantic sturgeon was designated as *Acipenser sturio* by Linnaeus in 1758. *Acipenser oxyrhynchus* is the form described from the American Atlantic coast by Mitchill in 1815. It would thus appear that two distinctly different species occupy the opposite sides of the North Atlantic. Yet in fact we do not know whether the North Atlantic sturgeons represent one or two species, since adequate samples of these two groups have never been studied or compared. As a consequence, some authors call the North American Atlantic sturgeon *A. sturio* or *A. sturio oxyrhynchus*, while others refer to it as *A. oxyrhynchus*. Since the North American form was described as *A. oxyrhynchus* and since the use of this name enables us to talk only about the Canadian Atlantic sturgeon in the current work, it is the name used. An adequate study in the future may reveal that the eastern and western forms should be recognized as one species and if this happens the name used will be *A. sturio*, since it was described before *A. oxyrhynchus*. At this time, however, the use of the name *A. sturio oxyrhynchus* implies a subspecific distinction that has not been proven to exist. (In a recent study, Magnin and Beaulieu[274] concluded that *A. oxyrhynchus* is a species

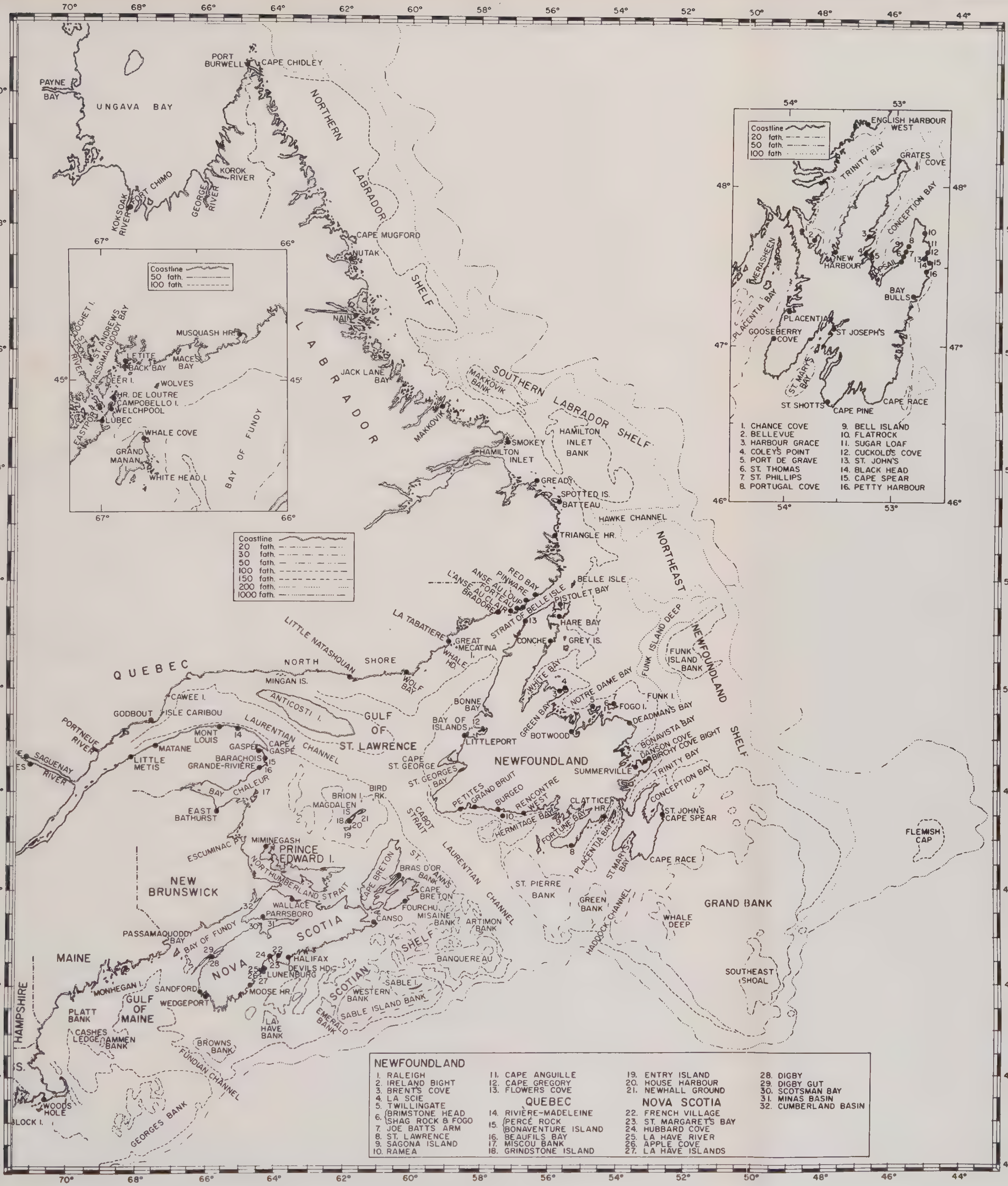

UNGAVA BAY
PAYNE BAY
PORT BURWELL
CAPE CHIDLEY
NORTHERN LABRADOR SHELF
KOKSOAK RIVER
FORT CHIMO
GEORGE RIVER
KOROK RIVER
CAPE MUGFORD
NUTAK
NAIN
LABRADOR
JACK LANE BAY
MAKKOVIK
MAKKOVIK BANK
SOUTHERN LABRADOR SHELF
SMOKEY
HAMILTON INLET
HAMILTON INLET BANK
GREADY
SPOTTED IS.
BATTEAU
HAWKE CHANNEL
TRIANGLE HR.
NORTHEAST NEWFOUNDLAND SHELF
RED BAY
PINWARE
ANSE AU LOUP
L'ANSE AU CLAIR
FORTEAU
BRADORE
STRAIT OF BELLE ISLE
BELLE ISLE
PISTOLET BAY
HARE BAY
GREY IS.
CONCHE
LA TABATIERE
GREAT MECATINA I.
WHALE HD.
LITTLE NATASHQUAN
NORTH SHORE
WOLF BAY
MINGAN IS.
QUEBEC
ANTICOSTI I.
GULF OF ST. LAWRENCE
LAURENTIAN CHANNEL
CAWEE I.
GODBOUT
ISLE CARIBOU
PORTNEUF RIVER
SAGUENAY RIVER
MATANE
LITTLE METIS
MONT LOUIS
GASPÉ
CAPE GASPÉ
BARACHOIS
GRANDE-RIVIÈRE
BAY CHALEUR
EAST BATHURST
FUNK ISLAND DEEP
FUNK ISLAND BANK
FUNK I.
FOGO I.
NOTRE DAME BAY
WHITE BAY
GREEN BAY
BOTWOOD
DEADMANS BAY
BONAVISTA BAY
DANSON COVE
BIRCHY COVE BIGHT
TRINITY BAY
CONCEPTION BAY
SUMMERVILLE
BONNE BAY
BAY OF ISLANDS
LITTLEPORT
NEWFOUNDLAND
CAPE ST. GEORGE
ST. GEORGES BAY
BIRD RK.
BRION I.
MAGDALEN IS.
CABOT STRAIT
PETITES
GRAND BRUIT
BURGEO
RENCONTRE WEST
HERMITAGE BAY
FORTUNE BAY
CLATTICE HR.
PLACENTIA BAY
ST. MARYS BAY
ST. JOHN'S
CAPE SPEAR
CAPE RACE
FLEMISH CAP
ST. PIERRE BANK
GREEN BANK
HADDOCK CHANNEL
WHALE DEEP
GRAND BANK
SOUTHEAST SHOAL
MIMINEGASH
ESCUMINAC PT.
PRINCE EDWARD I.
NORTHUMBERLAND STRAIT
NEW BRUNSWICK
CAPE BRETON
BRAS D'OR
ST. ANNS BANK
CAPE BRETON
FOURCHU
MISAINE BANK
ARTIMON BANK
LAURENTIAN CHANNEL
WALLACE
PARRSBORO
CANSO
NOVA SCOTIA
SCOTIAN SHELF
BANQUEREAU
SABLE I.
WESTERN BANK
SABLE ISLAND BANK
EMERALD BANK
LA HAVE BANK
HALIFAX
DEVILS HD.
LUNENBURG
MOOSE HR.
SANDFORD
WEDGEPORT
PASSAMAQUODDY BAY
BAY OF FUNDY
MAINE
MONHEGAN I.
GULF OF MAINE
PLATT BANK
CASHES LEDGE
AMMEN BANK
BROWNS BANK
FUNDIAN CHANNEL
GEORGES BANK
HAMPSHIRE
WOODS HOLE
BLOCK I.
Coastline
20 fath.
30 fath.
50 fath.
100 fath.
150 fath.
200 fath.
1000 fath.
ST. CROIX RIVER
ST. ANDREWS
PASSAMAQUODDY BAY
MUSQUASH HR.
LETITE
BACK BAY
MACES BAY
DEER I.
WOLVES
HR. DE LOUTRE
CAMPOBELLO I.
WELCHPOOL
LUBEC
EASTPORT
WHALE COVE
GRAND MANAN
WHITE HEAD I.
BAY OF FUNDY
ENGLISH HARBOUR WEST
TRINITY BAY
GRATES COVE
CONCEPTION BAY
MERASHEEN
NEW HARBOUR
TOPSAIL
BAY BULLS
PLACENTIA BAY
PLACENTIA
GOOSEBERRY COVE
ST JOSEPH'S
ST. MARY'S BAY
ST. SHOTTS
CAPE PINE
CAPE RACE
1. CHANCE COVE
2. BELLEVUE
3. HARBOUR GRACE
4. COLEY'S POINT
5. PORT DE GRAVE
6. ST. THOMAS
7. ST. PHILLIPS
8. PORTUGAL COVE
9. BELL ISLAND
10. FLATROCK
11. SUGAR LOAF
12. CUCKOLD'S COVE
13. ST. JOHN'S
14. BLACK HEAD
15. CAPE SPEAR
16. PETTY HARBOUR
NEWFOUNDLAND
1. RALEIGH
2. IRELAND BIGHT
3. BRENT'S COVE
4. LA SCIE
5. TWILLINGATE
6. BRIMSTONE HEAD, SHAG ROCK & FOGO
7. JOE BATTS ARM
8. ST. LAWRENCE
9. SAGONA ISLAND
10. RAMEA
11. CAPE ANGUILLE
12. CAPE GREGORY
13. FLOWERS COVE
QUEBEC
14. RIVIÈRE-MADELEINE
15. PERCÉ ROCK, BONAVENTURE ISLAND
16. BEAUFILS BAY
17. MISCOU BANK
18. GRINDSTONE ISLAND
19. ENTRY ISLAND
20. HOUSE HARBOUR
21. NEWHALL GROUND
NOVA SCOTIA
22. FRENCH VILLAGE
23. ST. MARGARET'S BAY
24. HUBBARD COVE
25. LA HAVE RIVER
26. APPLE COVE
27. LA HAVE ISLANDS
28. DIGBY
29. DIGBY GUT
30. SCOTSMAN BAY
31. MINAS BASIN
32. CUMBERLAND BASIN

FIG. 2. Chart of the Canadian Atlantic region showing major fishing banks, and general area covered in this Bulletin.

distinct from *A. sturio*; therefore the name *A. oxyrhynchus* should be applied to the North American form.)

Many recent publications on fishes, for example *Checklist of common and scientific names of fishes from the United States and Canada* (Special Publication No. 2, American Fisheries Society, 1960), employ names, especially of orders, that are unlike those used in the present work. To avoid confusion and to facilitate cross-reference, such accredited names as those used by the American Fisheries Society appear in parentheses following the name used in this Bulletin.

The common names generally agree with those published by the American Fisheries Society in its 1960 publication. French common names have resulted from consultation with Quebec authorities. For many fishes no common names, English or French, were known; in such cases, names were coined.

AREA COVERED

This report is concerned with fishes occurring in the waters between Cape Chidley (northeasterly tip of Labrador) and a line drawn south southwest of the southern tip of Grand Manan Island, New Brunswick, and extending seaward to approximately the 1000-fathom depth contour.

Because of the complexity of bottom contour of the Gulf of St. Lawrence and offshore areas, an offshore depth limit has been difficult to designate. To accept the 100- or 200-fathom line would exclude portions of the Gulf of St. Lawrence itself, where depths may extend to 350 fathoms. In general terms, however, the 1000-fathom line has been taken as the offshore limit (Fig. 2).

OUTLINE OF A SPECIES ACCOUNT

The species accounts have been prepared in accordance with a general plan so that comparable information, where available, can be located in the same relative position in each account. Deviation from this plan has occurred in about 40 species that have been added after the main body of the text had been completed. In such instances, only abbreviated accounts are provided since the state of knowledge does not permit more complete treatment.

The species accounts are arranged as follows:

Common name: by which the animal is known in the area in:

English **French**

Scientific name (Authority and date)

OTHER COMMON NAMES: other names used to designate this species

DESCRIPTION: Body—general shape, depth as a ratio of total length, caudal peduncle depth where pertinent, and distinctive features. Head—general shape, length ratios, eye size (eye diameter), characteristics of mouth such as tooth description. Fins—sequence of coverage in general is as follows: dorsal, adipose, caudal, anal, pelvic, and pectoral; general shape and position (relative to other parts,

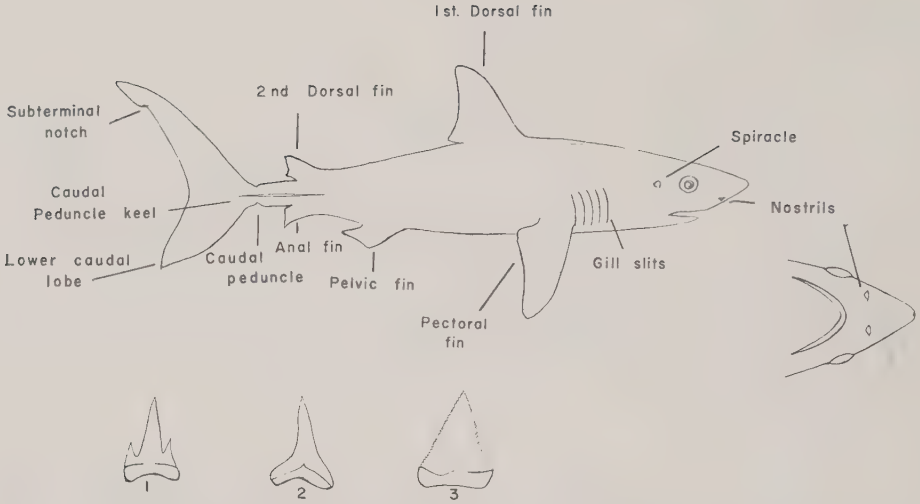

1st. Dorsal fin
2nd Dorsal fin
Subterminal notch
Spiracle
Caudal Peduncle keel
Nostrils
Anal fin
Lower caudal lobe
Caudal peduncle
Gill slits
Pelvic fin
Pectoral fin
1
2
3

FIG. 3. Views of hypothetical shark to show body parts, ventral view of head, and three examples of shark teeth: 1) porbeagle—to show lateral cusps; 2) blue shark—to show a long attenuated tooth with smooth edges; and 3) white shark—to show a broad triangular tooth with coarsely serrated lateral edges.

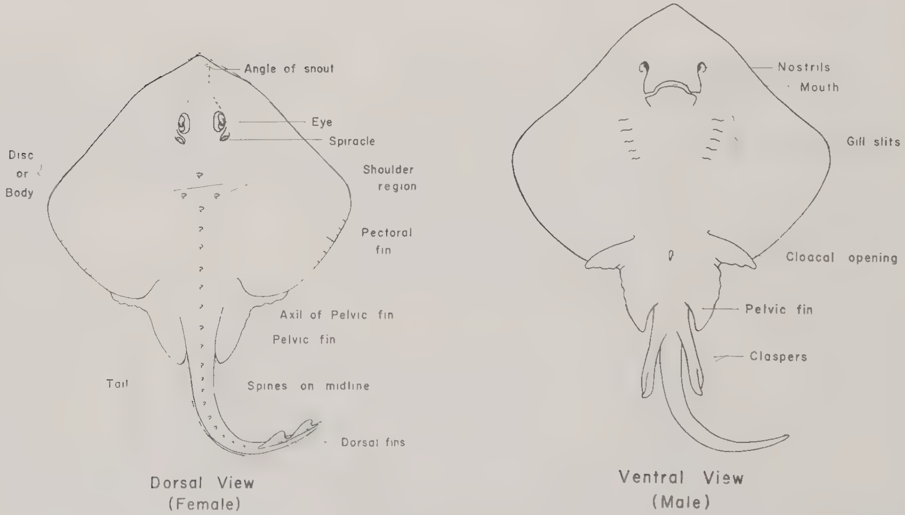

Angle of snout
Eye
Spiracle
Disc or Body
Shoulder region
Pectoral fin
Axil of Pelvic fin
Pelvic fin
Tail
Spines on midline
Dorsal fins
Dorsal View (Female)
Nostrils
Mouth
Gill slits
Cloacal opening
Pelvic fin
Claspers
Ventral View (Male)

FIG. 4. Dorsal and ventral view of a typical skate to show some of the important features of the body.

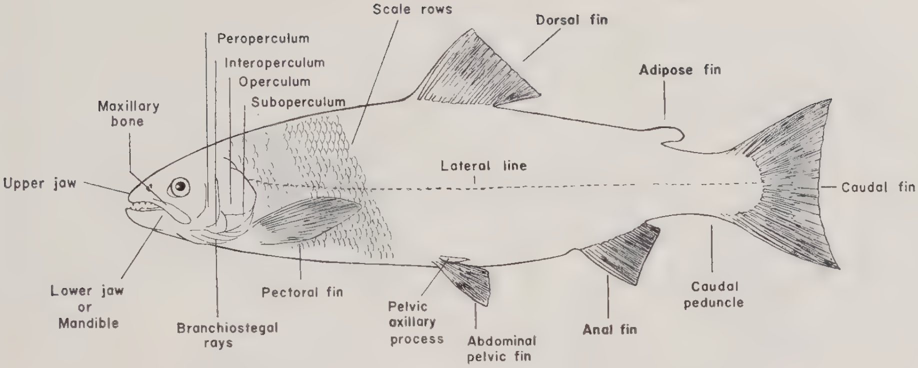

Scale rows
Dorsal fin
Peroperculum
Interoperculum
Operculum
Suboperculum
Adipose fin
Maxillary bone
Upper jaw
Lateral line
Caudal fin
Lower jaw or Mandible
Pectoral fin
Pelvic axillary process
Abdominal pelvic fin
Anal fin
Caudal peduncle
Branchiostegal rays

FIG. 5. Lateral view of a soft-rayed bony fish to show body parts.

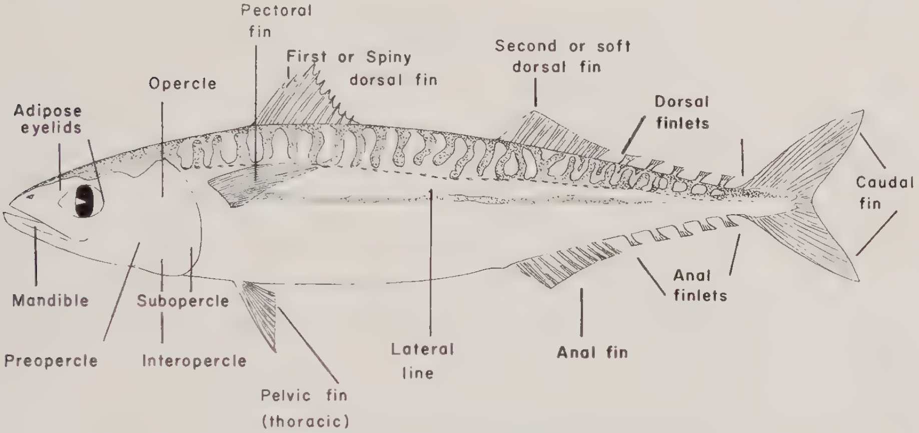

Pectoral fin
First or Spiny dorsal fin
Second or soft dorsal fin
Opercle
Adipose eyelids
Dorsal finlets
Caudal fin
Mandible
Subopercle
Anal finlets
Preopercle
Interopercle
Lateral line
Anal fin
Pelvic fin (thoracic)

FIG. 6. Lateral view of a spiny-rayed bony fish showing body parts.

anus, etc.); and fin rays, kind (spines or soft rays) and number. The method of measurement for bony fishes in general follows that outlined by Hubbs and Lagler[201] and, for sharks and rays, that prescribed by Bigelow and Schroeder.[47, 50] (For further details see Fig. 3 to 9 and also the glossary.)

Colour—where possible life colours of the species are given.

DISTINCTIONS: Mention is made of those features that set a species apart from its close relatives; these features might be termed "field characters."

SIZE: The maximum size attained is usually given and, when available, average sizes are also provided.

RANGE: Total known range is given.

Canadian distribution: Known occurrence in the Canadian area.

BIOLOGY AND ECONOMICS: This category has been employed where available information or the contribution to the commercial catch seemed to warrant it.

The fishes and fish-like vertebrates living in the fresh and salt waters of the world are classified or grouped into three major categories called classes. Each class is readily distinguishable from the other two. These three classes are Marsipobranchii (hagfishes and lampreys), Selachii or Elasmobranchii or Chondrichthys (sharks, rays, and chimaeras), and the Pisces or Osteichthys (bony fishes or "true" fishes). Workers in different countries of the world sometimes use different names in referring to the same class, thus the terms Selachii or Elasmobranchii or Chondrichthys have equal meaning and all refer to the cartilaginous fishes—the sharks and their close relatives, the rays, and chimaeras.

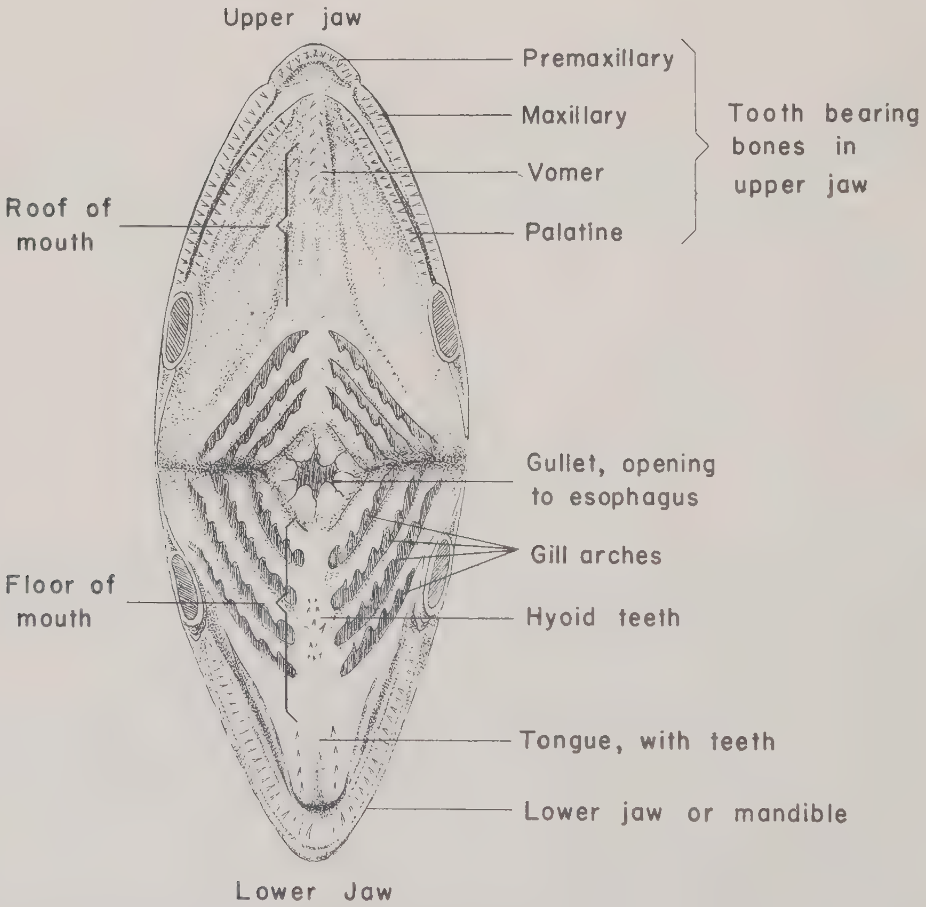

Upper jaw
Premaxillary
Maxillary
Vomer
Palatine
Tooth bearing bones in upper jaw
Roof of mouth
Gullet, opening to esophagus
Gill arches
Floor of mouth
Hyoid teeth
Tongue, with teeth
Lower jaw or mandible
Lower Jaw

FIG. 7. Stylized drawing of the open mouth of a salmonoid fish to show the various features.

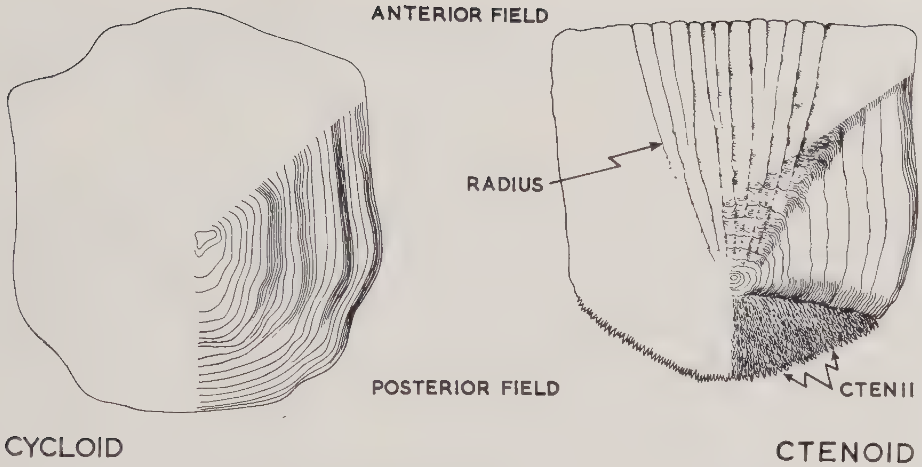

ANTERIOR FIELD
RADIUS
POSTERIOR FIELD
CTENII
CYCLOID
CTENOID

FIG. 8. Sketches of hypothetical scales to show major features.

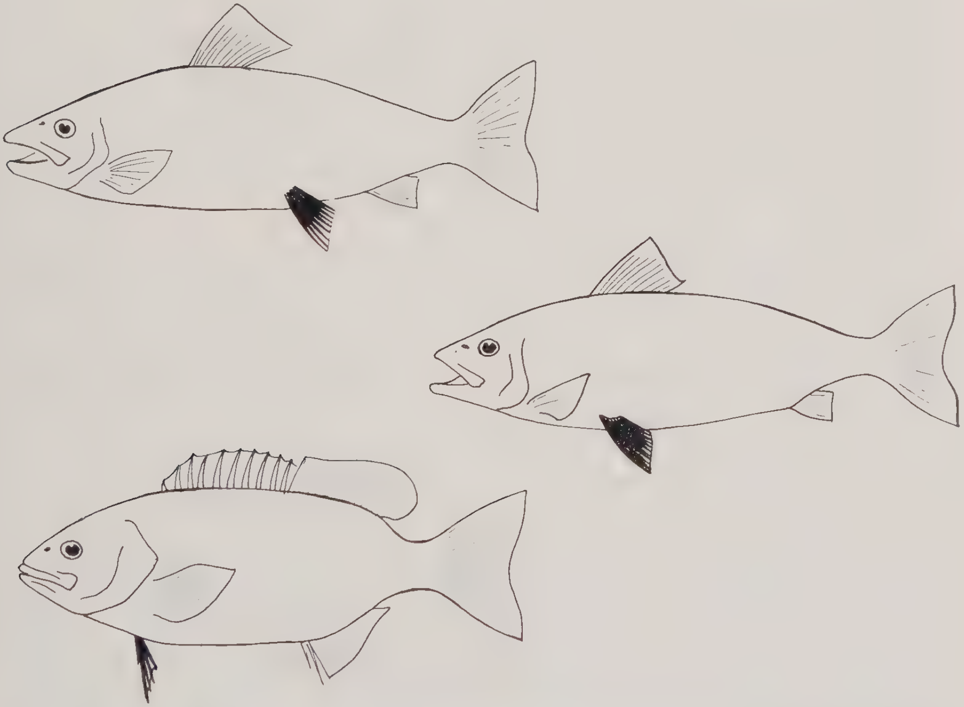


FIG. 9. Sketches to show various positions of the pelvic fin: Top: abdominal; Centre: thoracic; Bottom: jugular.

Each of these three classes is further subdivided into subclasses, orders, suborders, and families.

To identify a fish, turn first to the Key to Major Categories (below) and determine whether the fish in hand is a lamprey, a hagfish, a shark, a ray, a chimaera, or a bony fish.

This first key will direct you then to one of five keys. With the exception of the bony fishes, the second key will assist in making a final identification. The bony fishes, however, is a very large group, and includes the great majority of Atlantic fishes. Final identification of these is, therefore, a bit more involved. If the unidentified specimen is a bony fish, the Key to the Orders and Families of Bony Fishes (p. 72) will then assist in deciding if the specimen is a member of the herring family, salmon family, cod family, etc. Separate keys to these particular families will enable final identification to be made.

These keys were deliberately prepared in steps so that the user could identify a specimen to the broad group, to the family, or to the particular species if so desired. Those already familiar with fishes may proceed at once to the appropriate, final key.

KEY to MAJOR CATEGORIES

1 Jaws absent; fins without rays, paired fins absent; body elongate and snake-like; skin smooth, with one or 7 pairs of pore-like gill openings; a single median nostril; length to about 3 feet .... Hagfishes and lampreys, class Marsipobranchii (p. 19)

Articulated jaws present, lower jaw movable; typically with paired pectoral and pelvic fins 2

2 Gill openings slit-like, 5 pairs, either on sides or on under surface of body; body fusiform (sharks), or flattened (rays); skin more or less rough with small and/or large spines, never with overlapping scales .... Sharks and rays (class Selachii) 3

One gill opening on each side; separate anal and urinogenital openings (i.e. no cloaca) 4

3 Body shape fusiform (i.e. spindle-shaped or shark-like); gill openings on side of body; caudal fin distinct and heterocercal; teeth usually sharp and strong, sometimes very small .... Sharks, order Pleurotremata (p. 24)

Body shape flattened dorso-ventrally with gill openings on lower surface; pectoral fins broad and wing-like, attached throughout length to head and body; tail rod-like .... Rays, order Hypotremata (p. 49)

4 Operculum a flap of skin; caudal fin ending in a point; no distinct anal fin, skin smooth or denticulate; mouth inferior, with 2 pairs of plates in upper jaw and one pair in lower jaw; males with club-shaped clasper on forehead; skeleton cartilaginous, without distinct vertebral centra .... Chimaeras, order Chimaeriformes (p. 69)

Operculum typically a bony flap; caudal fin various; distinct anal fin usually present; body usually covered with overlapping scales, sometimes naked, or plated; highly variable in body shape; skeleton ossified (except in sturgeons) ... . Bony fishes, class Pisces (Osteichthyes) (p. 72)

Class **MARSIPOBRANCHII**—HAGFISHES AND LAMPREYS

This small group of eel-shaped, fish-like creatures are the most primitive of the living vertebrates and are represented in the salt and fresh waters of the world by less than 50 species. The ancestors of this group are thought to have arisen in the Ordovician period about 400 million years ago. This class embraces both living and fossil forms and the names Agnatha ("without jaws") and Ostracodermi ("shell skin") are sometimes used as alternative names to Marsipobranchii ("pouch" or "purse" gills).

Living marsipobranchs are grouped in the subclass Cyclostomata, meaning "round mouths," and include the hagfishes and lampreys. The bodies of these are smooth-skinned and internally there is a skeleton composed not of bone, but of cartilage. The lack of jaws, true teeth, paired fins, pelvic, and pectoral girdles is further evidence of their primitive nature. Lampreys and hagfishes differ from each other in many ways but particularly in the structure of the nasal apparatus.

The lampreys, having a nasal sinus with an external opening on top of the head, but no internal opening, are placed in the order Hyperoartia.

The hagfishes, which have a nasal passage with an opening below the upper lip and communicating with the pharynx, are placed in the order Hyperotreta.

KEY to Class MARSIPOBRANCHII

Three pairs of barbel-like tentacles about mouth and nostrils; one gill opening on each side, far behind head; mouth not cup-like .... Northern hagfish, *Myxine glutinosa* (p. 20)

No barbels on head; 7 distinct gill openings on each side of head; mouth cup-like and lined with horny teeth (in adults) .... Sea lamprey, *Petromyzon marinus* (p. 21)

Family MYXINIDAE Hagfishes

All living hagfishes, some 15 species in 4 genera, are grouped in this family. All species are marine, dwelling in the deeper parts of the shore waters of the world. They are essentially scavengers, devouring the soft tissues of dead and dying fishes. Unlike the lampreys, they are hermaphroditic and there is no larval stage, for on hatching from the egg the young resemble the adult.

Hagfishes have smooth, elongate slimy bodies, fleshy barbels around a small mouth that is armed with sharp tongue-teeth (for rasping into flesh), 1–14 pairs of pore-like gill openings and a low dorsal fin continuous with the caudal and anal fins.

Northern hagfish — Myxine du nord

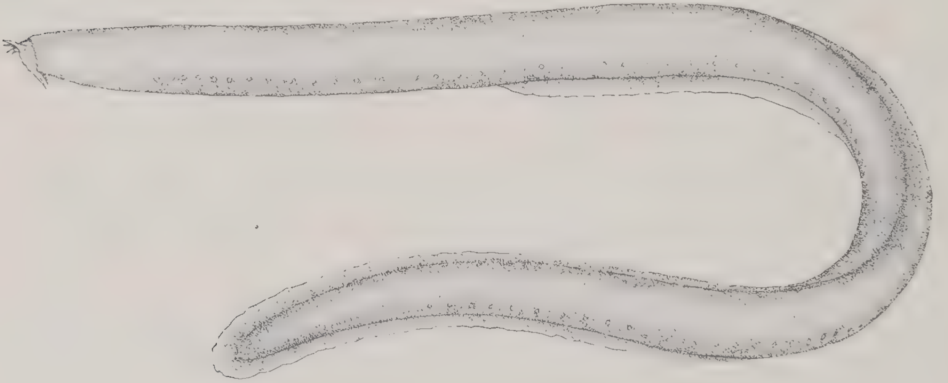
Myxine glutinosa Linnaeus 1758

OTHER COMMON NAMES: Atlantic hagfish

DESCRIPTION: Body eel-shaped. Mouth lipless, with a barbel on either side. Fins: no paired fins and no fin rays; a fold of skin resembling a fin beginning dorsally well behind the middle, running around the tail and ending on the ventral side about one-third the length from the head. Vent opens through the fin fold. A single nostril at the tip of the snout, surrounded by four barbels. No eyes. A single gill pore on each side, just forward of the origin of ventral fin fold. A series of mucus sacs on either side of the abdomen.

Colour, uniformly brownish to reddish brown above, whitish or pale gray below; sometimes mottled.

SIZE: Length usually 18 to 24 inches, rarely longer.



RANGE: Widely distributed in Arctic seas and down both coasts of the North Atlantic; south to North Carolina in the western Atlantic and to the Irish Sea in Europe. A closely related, if not identical, form occurs in the southern hemisphere.

Canadian distribution: Davis Strait;[213] Pointe-des-Monts, north shore of Gulf of St. Lawrence;[506] Passamaquoddy Bay, Campobello, Grand Manan, Bliss Island. N.B. Common on Nova Scotian Banks.[513] Southern Newfoundland and Grand Banks.[17, 49] They may sometimes be taken in numbers in wire traps set off Deer Island, Passamaquoddy Bay, N.B.

BIOLOGY AND ECONOMICS: Found chiefly in depths of 15 fathoms or more on soft, muddy bottom. Hagfish produce very large amounts of slime when handled or otherwise disturbed.

Females produce small numbers of eggs, not over 30, which are large, up to 1 inch long, oblong, having a horny shell and a cluster of anchor-tipped filaments at each end. The eggs are deposited on bottom and adhere to solid objects by means of the filaments and slime.

Eggs have been reported from the Bay of Fundy, from Georges Bank and from the south coast of Newfoundland.

Hagfish are scavengers and frequently are found burrowing into dead hake, haddock, and other fish that have been caught by fishing gear.

Family PETROMYZONTIDAE Lampreys

All living lampreys, some 30 species in 7 genera, are grouped in this family. All species are anadromous or freshwater, primarily inhabiting temperate waters of the northern and southern hemispheres. Lampreys are primarily parasitic and have a prolonged and somewhat complex life history involving 4 or more years. From the egg hatches a larval form, without eyes, and with an overhanging oval hood. This larva or ammocoete lives in soft ooze or sandy bottoms of streams and ponds for some years, the precise number depending upon the species. On maturing the small young adult, now with eyes and with a cup-shaped mouth lined with horny teeth, normally commences a parasitic mode of life. Some freshwater species do not pass through a parasitic phase but spawn soon after transformation and then die.

Lampreys have smooth, elongate, slimy bodies, a suctorial type of mouth lined with sharp horny teeth, 7 pairs of pore-like external gill openings and a well developed median dorsal fin.

Sea lamprey Grande lamproie marine

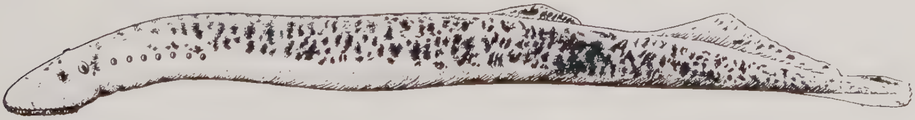
Petromyzon marinus Linnaeus 1758

OTHER COMMON NAMES: lamper, lamper-eel

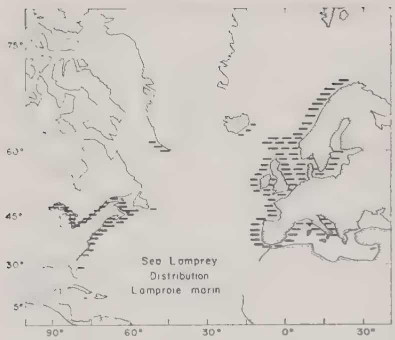
DESCRIPTION: Body eel-shaped, sub-cylindrical forward, compressed behind. Mouth nearly circular, with numerous conical teeth in concentric series, lateral ones on each side of mouth bicuspid, the others simple. Eyes present in adult, small. Fins: dorsals (2), well separated, the first with its origin more than half way back on the body, the second larger and separated from caudal; caudal small; no paired fins. Seven gill openings on each side, arranged in a row beginning just behind the eye. Skeleton soft, cartilaginous.

Colour, bluish-brown, mottled with blackish confluent patches, rarely plain; whitish below. Colours brighter with yellowish hues at spawning time.

SIZE: Up to a length of about 3 feet.



RANGE: The sea lamprey, an anadromous species, occurs off the Atlantic coast of North America from southwest Greenland, south to northern Florida. Apart from



the Greenland records, the northward extent of its range appears to be the estuary and south shore of the Gulf of St. Lawrence. It is found, landlocked, in the Great Lakes, in Lake Champlain and lakes in western and northern New York State. On the European coast its range extends from northern Norway, the Faroes, through the North Sea and into the Baltic up to the Gulf of Finland. It occurs southward to the Mediterranean and into the Adriatic Sea.

Canadian distribution: St. Mary's, Musquodoboit, Sackville, LaHave, Medway, Mersey, Annapolis and Shubenacadie rivers in Nova Scotia;[268] Saint John, Kennebecasis, and Petitcodiac rivers, New Brunswick;[205] Bersimis River, Labrador.[269] Reported in the sea from Passamaquoddy Bay;[205] one, about 12 inches long from north of Emerald Bank (lat 43°50′N, long 62°25′W);[500] and from Banquereau, Sable Island, LaHave, and Browns banks.[49] It has never been recorded from Newfoundland waters but a specimen was reported, attached to the bottom of a fishing boat, 1½ miles off the coast near St. John's, in November 1946.

BIOLOGY AND ECONOMICS: The sea lamprey is seldom caught at sea and little is known of its behaviour there. It ascends freshwater streams where spawning occurs. The adults die after spawning and dead lampreys have been observed in the LaHave River in late June and early July.

Lampreys spawn in the freshwater portions of many rivers, preferring a stony or gravelly bottom. The parent fish excavate depressions in the stream bed, about 6 inches deep and 2–3 feet in diameter. The eggs are deposited in these areas, each female producing up to 230,000 eggs.

The eggs hatch into a larval form, blind and toothless, with a hood over the mouth; this is the so-called ammocoete stage, which lives in or on the mud of the stream beds. Small ones, about ½ inch long, have been found in the Shubenacadic and Annapolis rivers in June and larger ones, up to 2¾ inches long, have been found in brackish estuarial situations farther down the rivers. They spend 3–4 years in this larval stage.

While the larvae (or ammocoetes) eat small organisms, the adults prey on live fishes to which they adhere by means of their sucker-like mouths, rasping away the scales and flesh with their teeth and nourishing themselves with the blood and body juices of their victims. They attack cod, haddock, hake, mackerel, shad, salmon, sharks, and sturgeon. In fresh water they attack various fishes, especially salmonoids.

No use is made of lampreys at the present time. They are not abundant enough to be of concern in the Atlantic region but in the Great Lakes they have destroyed large numbers of commercial whitefish and lake trout, and measures for their control are in use. Commercially caught swordfish are aften marked by lampreys and they have been observed attached to these fish.

Class **SELACHII** (OR **CHONDRICHTHYES**)—CARTILAGINOUS FISHES

There are about 600 species of cartilaginous fishes occurring chiefly in oceanic waters. Unlike the Marsipobranchii these fishes have true jaws and teeth, paired fins with pectoral and pelvic girdles, paired nostrils located ventrally, and scales in the form of dermal denticles. The skeleton is entirely cartilaginous without any true bone, but often calcified and a chondocranium is present. The fins have segmented, cartilaginous rods as basal supports. There is a spiral valve in the lower section of the intestine. There is no swimbladder (or air bladder). Fertilization is internal and is effected by claspers formed from the modified inner portions of the pelvic fins of the males. Reproduction is oviparous or ovoviviparous.

The cartilaginous fishes are the second of three classes of living fishes and include the sharks, the skates or rays, and the chimaeras, these being classified into two subclasses, the Euselachii (sharks and rays), and Holocephali (the chimaeras).

Subclass EUSELACHII (ELASMOBRANCHII)—SHARKS, SKATES, RAYS

There are approximately 550 known species of sharks and rays classified into two orders. All are characterized by having many teeth in the jaws, the upper jaw not attached to the skull, a spiracle present, 5–7 pairs of gills and slit-like gill openings located either laterally (sharks) or ventrally (rays or skates). The alimentary canal, urinary ducts, and female reproductive ducts open into a cloaca which in turn has a single external opening.

The subclass is divided rather naturally into two orders, the sharks, Pleurotremata (literally "side holes"), and the skates or rays, Hypotremata (literally "lower holes"), the names in both cases referring to the position of the gill slits.

Order PLEUROTREMATA (Squaliformes)—SHARKS

Approximately 225 species of sharks are recognized, these being classified in about 80 genera, 14 families, and 3–7 suborders. The term Squaliformes is sometimes used instead of Pleurotremata.

Generally sharks are characterized by their elongate fusiform bodies, having rather conspicuous gill slits in a lateral position immediately anterior to the pectoral fin, this fin being free anteriorly; the teeth are sharp, pointed and in regular rows. The caudal fin is heterocercal or asymmetrical, the upper lobe being larger than the lower lobe. The vertebral column extends into the upper lobe. The young are born alive, living miniatures of the adults, but in rare cases eggs are laid, these being enclosed in elongate, horny capsules.

The sharks seem always to have held a special fascination. Although only a few species dwell off our coasts the year round, a number of other species visit

Canadian waters during the warmer summer months. At least three species of sharks have been reported for our waters for the first time since 1961, probably as a result of greater watchfulness by Canadian biologists and it is likely that more species, particularly wanderers or summer migrants, will be reported when more careful observations are made. Sharks are carnivorous, feeding on other animals. They are able to remove large mouthfuls of tissue from whales and other creatures by biting, then shaking the head like a dog, thereby using the sharp lateral cutting edges of their teeth to sever the musculature. The largest of all fishes, the whale shark, and also the basking shark, feed only on small, planktonic organisms. There are no records of sharks attacking bathers in our waters.

The 18 species reported for Canadian Atlantic waters are allocated to nine families. Templeman[472] gives a comprehensive review of the occurrence of sharks in Newfoundland waters.

KEY to Order PLEUROTREMATA—Sharks

1 Anal fin present 2
Anal fin absent 14

2 Head greatly expanded laterally; eyes located at the lateral extremities .... Smooth hammerhead, *Sphyrna zygaena* (p. 40)
Head not greatly expanded or enlarged laterally; body fusiform and typically shark-like 3

3 Dorsal lobe of caudal fin greatly enlarged, as long as head and body combined .... Thresher shark, *Alopias vulpinus* (p. 27)
Dorsal lobe of caudal fin nearly equal in size to lower lobe, or only 2 or 3 times larger 4

4 Gill slits or openings greatly enlarged, the first pair nearly meeting over the throat, and all 5 seeming to almost sever the head; teeth minute and numerous; well-developed lateral keels on caudal peduncle .... Basking shark, *Cetorhinus maximus* (p. 29)
Gill slits of moderate size, not extending almost around body; teeth not minute but well developed (smooth and pavement-like in *Mustelus canis*) 5

5 Origin of first dorsal fin distinctly posterior to origin of pelvic fins .... Deepsea cat shark, *Apristurus profundorum* (p. 34)
Origin of first dorsal fin anterior to origin of pelvic fins 6

6 Teeth smooth and pavement-like; 2 dorsal fins, the 2nd almost as large as the first; origin of first dorsal overlapping posterior quarter of pectoral fin; spiracle below and behind posterior corner of eye .... Smooth dogfish, *Mustelus canis* (p. 38)
Teeth sharp and pointed; 2 dorsal fins, the first larger than 2nd, the 2nd sometimes quite small (2nd dorsal only slightly smaller than first dorsal in *Carcharias taurus*) 7

7 First dorsal fin only slightly larger than 2nd and distinctly behind pectoral fins, free edge of first dorsal overlapping origin of pelvic fins .... Sand shark, *Carcharias taurus* (p. 26)

First dorsal fin obviously larger than 2nd dorsal fin 8

8 Caudal peduncle and caudal fin with one or more distinct lateral or horizontal keels 9

Caudal peduncle without distinct lateral keel 10

9 A second smaller lateral keel below primary keel, on lower lobe of caudal fin; teeth in adults with lateral cusps, one on each side of main cusp, these lateral cusps not obvious in young .... Porbeagle, *Lamna nasus* (p. 32)

No secondary keel below primary keel; teeth without lateral cusps 11

10 Teeth in upper and lower jaws without conspicuous serrations, margins entire; anal fin origin distinctly anterior to origin of 2nd dorsal fin .... Atlantic sharpnose shark, *Rhizoprionodon terraenovae* (p. 40)

Teeth in upper and lower jaws with conspicuous serrations (lower teeth of *Prionace* often smooth or finely serrate); 2nd dorsal fin origin over, or slightly in advance of, anal fin origin 12

11 Teeth slender and awl-like, the anterior teeth long and recurved; origin of dorsal fin wholly posterior to pectoral fins .... Mako, *Isurus oxyrinchus* (p. 33)

Teeth broad and triangular, the margins strongly serrated, alike in both jaws, providing straight cutting edges; origin of dorsal fin overlapping posterior portion of pectoral fins .... White shark, *Carcharodon carcharias* (p. 30)

12 First dorsal fin set far back, nearer pelvic than pectoral fins; pectoral fins long, about 3 times as long as broad; no prominent ridge on dorsal surface between dorsal fins; upper parts of body brilliant blue in colour .... Blue shark, *Prionace glauca* (p. 38)

First dorsal fin nearer pectoral than pelvic fins, its origin overlapping posterior margin of pectoral fin; length of pectorals moderate, less than 3 times as long as broad; a dorsal ridge present between the 2 dorsal fins 13

13 Dorsal fin apex broadly rounded; posterior tip of anal fin long, reaching nearly to lower precaudal pit; posterior margin of lower caudal lobe with convex outline; tips of dorsal, pectoral, and caudal fins often white .... Whitetip shark, *Carcharhinus longimanus* (p. 36)

Dorsal fin apex pointed; posterior tip of anal fin relatively short, not reaching nearly to lower precaudal pit; ridge between dorsal fins well developed .... Dusky shark, *Carcharhinus obscurus* (p. 37)

14 Dorsal fins without conspicuous spines at origin .... Greenland shark, *Somniosus microcephalus* (p. 42)

Dorsal fins each with a spine at the origin, spine sometimes concealed by skin (especially in *Centroscymnus*) 15

15 Teeth in upper and lower jaws alike 16

Teeth in upper and lower jaws not alike 17

16 Upper and lower teeth quadrangular, one cusp directed laterally to form an almost continuous cutting edge; dorsal fin spines rounded; trailing edge of upper caudal lobe entire; colour of body usually gray with light spots; length to about 3 feet .... Spiny dogfish, *Squalus acanthias* (p. 46)

Upper and lower teeth each with 3–5 triangular cusps; dorsal fin spines deeply grooved; trailing edge of upper caudal lobe notched; colour uniformly dark brown to black; 2–3 feet in length .... Black dogfish, *Centroscyllium fabricii* (p. 43)

17 Teeth in upper jaw with only one cusp; dorsal fin spines concealed by skin; body covered with flat overlapping denticles .... Portuguese shark, *Centroscymnus coelolepis* (p. 44)

Teeth in upper jaw with 5 erect cusps; dorsal fin spines conspicuous; body covered with distinct skin spines .... Rough sagre, *Etmopterus princeps* (p. 45)

Family CARCHARIIDAE Sand sharks

A small family, containing a few species confined mainly to warmer waters. These are large, swift sharks with large mouths; teeth long, slender, and pointed, each with two lateral cusps; no nictitating membrane; small spiracles present. There are two dorsal fins and an anal fin of comparable size, all spineless. The caudal peduncle is keelless.

Only one species occurs in Canadian waters.

Sand shark Requin-taureau

Carcharias taurus Rafinesque 1810

OTHER COMMON NAMES: ground shark

DESCRIPTION: Body moderately stout, deepest between pectorals and first dorsal; caudal peduncle deep and laterally compressed. Head slightly flattened; snout short; eye small, round; mouth ventral, teeth canine-like, smooth-edged, often with one or two small cusps near base, similar in both jaws. Fins: dorsals (2), almost equal in size, origin of first dorsal midway between axil of pectorals and origin of pelvics, height about one-half length of pectorals, origin of second dorsal about midway between cloaca and origin of anal; caudal heavy, with well-marked subterminal notch, front margin of lower lobe about one-third length of front margin of upper lobe; anal a trifle larger than second dorsal; pelvics about as large as first dorsal; pectorals not quite twice as long as broad, triangular, broadly based. Five moderately long gill slits, all in front of base of pectorals.

Colour, light grayish-brown above; paler on sides, grayish-white below; sides of trunk behind the pectorals may be marked with a number of round yellowish-brown spots; rear margins of fins sometimes edged with black.

Distinctions: This shark may be distinguished by the almost equal size of the two dorsal fins and the anal fin and by its long sharp teeth.

Size: Up to a length of 10 feet.

Range: Both sides of the Atlantic Ocean. In the western Atlantic the sand shark occurs from the Gulf of Maine to Florida and southern Brazil; in the eastern Atlantic from the Mediterranean, West Africa, Canary and Cape Verde Islands. A closely related species occurs in the Pacific. There is a single Canadian record. A specimen was caught in a weir in Passamaquoddy Bay, N.B., in 1913.[205]

Biology and Economics: The sand shark is a summer visitor in the northern part of its range. It is comparatively sluggish and lives close to the bottom. In the north it is a coastwise species.

Females have been found with eggs and embryos in the oviducts, indicating that the young are born alive.

The sand shark is known to eat a variety of fishes, including alewives, bluefish, butterfish, cunner, eels, menhaden, silver hake, as well as squid, crabs, and lobsters.

There is no indication that it ever attacks man.[47]

Family ALOPIIDAE — Thresher sharks

This is a small family of peculiarly-shaped oceanic sharks, closely related to the mackerel sharks and resembling them in the general disposition of the fins. The thresher sharks are remarkable for the enormously developed dorsal lobe of the caudal fin, equal in length to the remainder of the body.

There is one species in Canadian waters.

Thresher shark — Renard marin

Alopias vulpinus (Bonnaterre) 1788

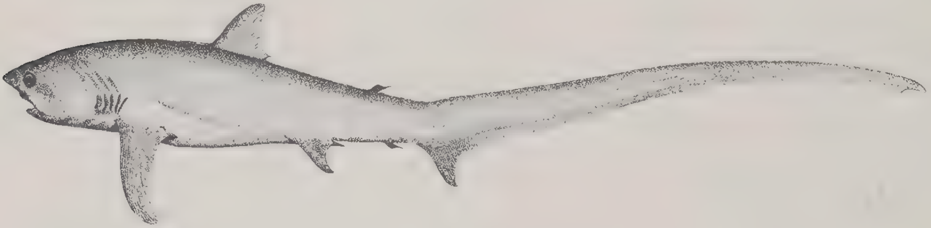
Other common names: swiveltail, swingletail

Description: Body stout, heaviest in front of dorsal fin; caudal peduncle heavy laterally compressed. Snout blunt, rounded; mouth ventral, teeth small, sharp, subtriangular, smooth-edged. Eye moderate, diameter one-third to one-half length of snout in front of mouth. Fins: dorsals (2), first moderate in height, its tip considerably anterior to the pelvic fins, second dorsal very small; caudal with upper lobe extremely long, usually slightly over half the total length of the shark, scythe-shaped, with no definite subterminal notch but with a prominence instead, lower lobe of caudal small, about equal in size to the pelvics; anal very small, behind second dorsal; pectorals long, sickle-shaped. Gill slits 5, short, the fourth and fifth above the origin of the pectoral fin.

Colour, back and upper sides blue-gray to nearly black, shading to white below except on the lower surfaces of the snout and pectoral fins, which may resemble the back in colour.

DISTINCTIONS: This shark may be distinguished from all others in our waters by the extreme length of the upper lobe of the tail.

SIZE: Maximum length including tail, 20 feet, but not often over 16 feet.



RANGE: Pelagic in warm temperate and subtropical latitudes, on both sides of the Atlantic ocean and in the eastern Pacific ocean. In the western Atlantic, the thresher shark occurs from Nova Scotia to northern Argentina; in the eastern Atlantic from Lofoten, Norway, to the Mediterranean and from Madeira to the Cape of Good Hope. A closely related species, if not identical, occurs in the western Pacific and Indian oceans.

Canadian distribution: There are few definite records. It was reported from Chaleur Bay, without details;[47, 49] a specimen, about 12 feet long, was landed at Halifax, N.S., in September 1926, and was seen by the senior author; a 16-foot specimen was caught in a weir at Deer Island, N.B., August 1936;[304] it was reported as frequent in Cumberland and Minas basins;[348] it was described to the senior author from weir catches at Scott's Bay and Parrsboro, N.S., in 1920, but no specimens were seen by him. Also reported, without details, from the banks off Nova Scotia.[47]

BIOLOGY AND ECONOMICS: The thresher shark only appears in Canadian waters in summer. It feeds on small fishes such as herring and mackerel and on squid. It uses the long, flail-like tail to herd its prey and to cut down individuals.

Females are mature at a length of 14 feet and are observed to contain two or four embryos. These may attain a length of 5 feet before birth.

The thresher shark is not abundant enough to have any significance in Canadian Atlantic waters.

Family CETORHINIDAE Basking sharks

This is a small family of large, sluggish, oceanic sharks closely related to the mackerel sharks and resembling that family in general body shape and in the shape and position of the fins. Caudal peduncle keeled, gill slits very large and seeming to nearly sever the head.

There is one species only in Canadian waters.

Basking shark **Pèlerin**

Cetorhinus maximus (Gunnerus) 1765

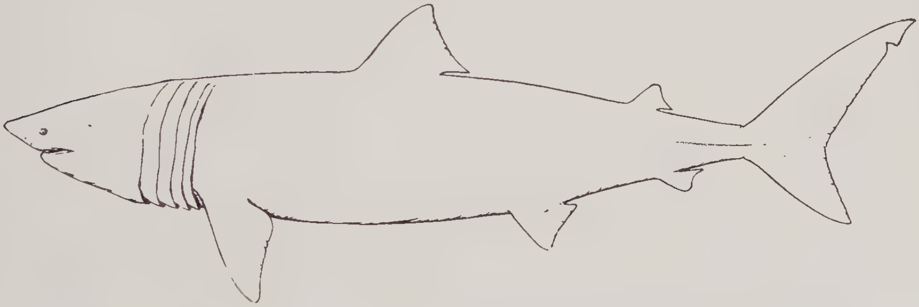
OTHER COMMON NAMES: bone shark

DESCRIPTION: Body elongate, stout; caudal peduncle with a prominent keel on each side. Mouth ventral, large; teeth very small, numerous. Eye small. Fins: dorsals (2), the first triangular, large; second dorsal small; anal fin about equal to second dorsal in size, inserted behind it; pectorals moderate; caudal lunate. Five long gill slits, extending from back and almost meeting on under side of throat; inner margin of each gill arch provided with a large number of long, dark rakers.

Colour, upper surface grayish-brown to slaty-gray; under surface usually white, but occasionally only slightly lighter than the back.

DISTINCTIONS: The basking shark may be distinguished from all other sharks by the long gill slits and the long, hard gill rakers.

SIZE: Basking sharks up to 32 feet in length are not uncommon and the species is reported to reach from 40 to 50 feet.



RANGE: Occurs in the north and south Atlantic and Pacific oceans but not in the tropics. Ranges in the western North Atlantic from Newfoundland to North Carolina; around Iceland; in Europe from the Murman coast to the Mediterranean. It occurs in the eastern North Pacific from southern California to northern British Columbia.

Canadian distribution: This shark which was once recorded infrequently in Canadian waters has been recorded more frequently in recent years. Dr. W. Templeman[472] in a summary of Canadian occurrences, has noted that there are now 61 Newfoundland records for the basking shark and 47 from the Canadian Atlantic area other than Newfoundland. The records suggest that the occurrences in the Canadian area have increased over the last 20–30 years, such that Newfoundland may now be considered a regular extension of the summer range.

BIOLOGY AND ECONOMICS: These sharks are sluggish. Even large ones, when caught in herring weirs do little or no damage to the structure. Since it is recorded only in the warmer parts of the year, it is believed to move farther south in winter. As the name indicates, basking sharks are sometimes seen lying at the surface with the dorsal fin projecting above the water.

The basking shark feeds exclusively on minute planktonic organisms, strained from the water by the gill rakers.

The basking shark is not abundant enough to have any commercial use. The liver oils were valuable for lighting purposes before petroleum oils were used but there is no such market now.

Family LAMNIDAE Mackerel sharks

The mackerel sharks are widely distributed, fast-swimming, pelagic species of subtropical, temperate, and northern seas. The body is spindle-shaped and the two lobes of the caudal fin are nearly of equal size and the fin crescent-shaped. The caudal peduncle has strong lateral keels. There are two dorsal fins, the first over the pectoral fins, the second over the anal fin. Mouth small to moderate in size, teeth variable in size and with or without lateral cusps. Spiracles are small or absent; gill slits large, the fifth slit at origin of pectoral fin; no nictitating membrane. Ovoviparous. They are called mackerel sharks because of the superficial resemblance to mackerel, i.e. spindle-shaped body, narrow keeled caudal peduncle, and crescent-shaped caudal fin.

Three species have been reported to occur in Canadian Atlantic waters.

White shark **Requin blanc**

Carcharodon carcharias (Linnaeus) 1758

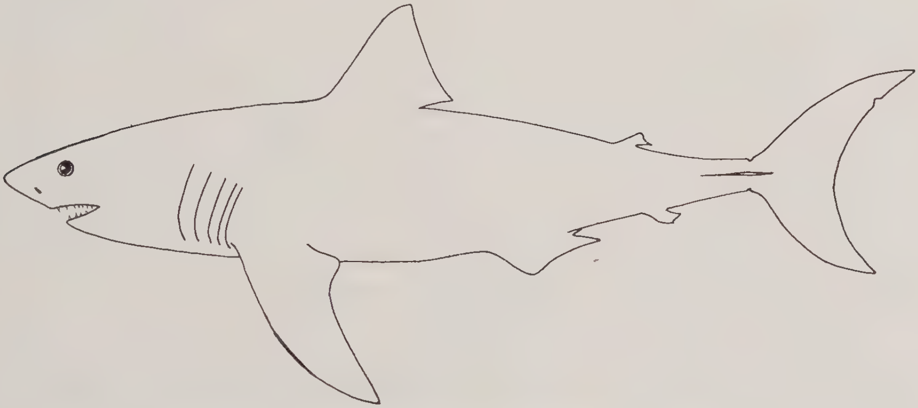
OTHER COMMON NAMES: maneater shark, mangeur d'homme

DESCRIPTION: Body fusiform, moderately stout, snout conical, caudal peduncle moderately heavy with heavy keel-like extensions on sides. Mouth ventral. Eye moderate in size. Fins: dorsals (2), the first large, roughly triangular with rounded apex, insertion behind the insertion of the pectoral fins; second dorsal small; anal small, inserted behind the level of the second dorsal; pectorals large, sickle-shaped; caudal lunate, upper lobe larger than lower. Gill slits five, their length about half the depth of the body at that point. Teeth large, numerous, triangular, cutting edges straight or with slightly concave edges and strongly serrated; teeth in lower jaw narrower than those in upper jaw.

Colour, slaty-brown to leaden-gray or black above, shading to a dirty white on the lower surface. A black spot in the axil of the pectorals, except in very large specimens; tips of pectorals black; dorsal and caudal fins dark along rear edges; pelvics darkest along front edge. Very large specimens leaden-white above.

DISTINCTIONS: The white shark can be distinguished from other sharks by the strong, triangular, serrated teeth in the upper jaw. Two other characters separate it from the closely related mackerel sharks; the anal fin is behind the second dorsal in the white shark but directly below it in the mackerel shark, and the pectoral fin of the white shark is one and one-half times to twice as long as the height of the first dorsal, whereas the pectoral fin of the mackerel shark is only slightly longer than the first dorsal.

SIZE: One of the largest of sharks, it grows up to 37 feet in length.[513] Specimens over 20 feet long, however, are rare.



RANGE: Widespread in tropical and warm temperate parts of all oceans; St. Pierre Bank to Brazil in the western Atlantic; Mediterranean Sea; Australia.

Canadian distribution: This shark occurs sporadically but occasionally may be reported several times in 1 year. The most northerly record is Ireland Bight, Hare Bay, Newfoundland, August 10, 1956.[472] The other records are from the outer coast of Nova Scotia or from the Bay of Fundy: (1) Hubbards Cove, N.S., July 27, 1920;[353] (2) 10 miles off Digby Gut, July 2, 1932;[353] (3) Deer Island, N.B., August 24, 1949, female, about 13 feet long, weight 1300 pounds;[396] (4) off Fourchu, N.S., July 9, 1953; (5) Wedgeport, N.S., July 10, 1953, male, 8 feet long; (6) LaHave Islands, N.S., August 12, 1953, 15 feet long; (7) two other suspected records, one inside and one outside Passamaquoddy Bay, N.B., in 1952 and 1953; in neither case was the shark seen but the marks on injured seal and porpoise indicated an attack by white sharks (no. 4–7);[110a] (8) Maces Bay, N.B., August 3, 1954, an 8-foot specimen identified by Day and Fisher. Records no. 1, 2, and 4 were identified from teeth only, but for records no. 3, 5, 6, and 8 the whole animal was examined. Templeman[472] records a specimen taken off southeast Grand Bank in August 1956. Piers[353] has provided a summary of occurrences in Nova Scotia waters to 1934.

BIOLOGY AND ECONOMICS: White sharks are active and vigorous. Their distribution in Canadian waters indicates that they appear only during the warmer season and the sparse records suggest that they are most frequent in warm-water years.[110a]

They are voracious, eating both large and small prey. They are known to eat seals, small sharks, dogfish, sturgeon, and tuna, as well as various small fishes and squid.[49]

White sharks occur so rarely in Canadian waters that their only importance lies in their being a potential menace to small boats when they are present. Several of the records given above have been associated with apparently unprovoked attack on dories and similar small boats, sometimes of such violence that the occupants were thrown into the water and, in at least one instance, drowned. There have been fatalities attributed to this species at bathing beaches in the United States but nothing of this kind has been reported in Canada. Nevertheless any large shark should be regarded with suspicion until its identity is established.

Porbeagle **Maraiche**

Lamna nasus (Bonnaterre) 1788

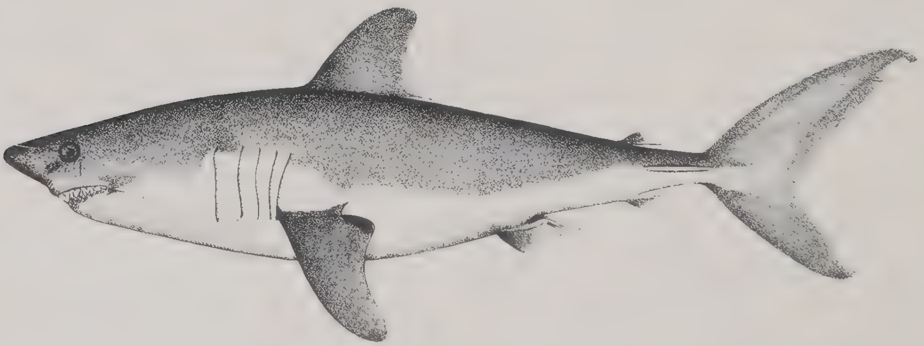
OTHER COMMON NAMES: mackerel shark, blue dog (erroneously)

DESCRIPTION: Body stout, heavy forward, snout conical; caudal peduncle slender. Mouth ventral. Eye large. Fins: dorsals (2), the first large, triangular with the apex rounded, inserted slightly behind pectorals; second dorsal very small; anal immediately below it and equally small; pectorals large, twice as long as broad; pelvics small; caudal heterocercal, lunate. Gill slits 5, just in front of pectoral, moderate in length equalling distance between snout and front of eye. Teeth alike in both jaws, slender, pointed, smooth-edged, with a sharp denticle near the base on each side, the latter often lacking in young specimens.

Colour, dark bluish-gray to bluish-black above; white below; lower surfaces of pectorals dusky to black on the outer half, mottled white and dark toward their bases.

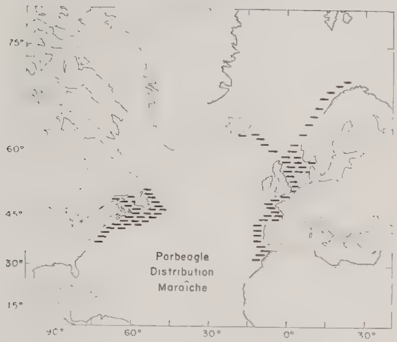
DISTINCTIONS: The porbeagle can be distinguished from the maneater shark by its slender, smooth-edged teeth and by the origin of the first dorsal fin behind the pelvic base and the position of the second dorsal fin directly above the anal fin. It can be separated from the closely allied sharp-nosed mackerel shark by the lateral cusps on the teeth; these are absent in the sharp-nosed species; the porbeagle's body is stouter and possesses a secondary longitudinal keel on the caudal fin.

SIZE: Reported up to a length of 12 feet but specimens over 8 feet long are rare.



RANGE: The porbeagle inhabits the continental waters on both sides of the North Atlantic. Off the North American coast it ranges from its most northerly record at Raleigh on the northern coast of Newfoundland,[209] the Newfoundland Banks, and the Gulf of St. Lawrence to New Jersey, and perhaps South Carolina. Off the European coast the range of the porbeagle extends southward from southern

Scandinavia, Orkneys, Scotland, North Sea to northwestern Africa. It is less common north to Iceland, northern Norway, and the Murman coast.[47] On the west coast of North America, the porbeagle is represented in the North Pacific from northern California to southern Alaska, Kamchatka, and Japan, as well as in the Australia–New Zealand region, by forms closely allied but not identical.



Canadian distribution: Jeffers[209] report of specimens taken in July 1926, at Raleigh, Nfld., is apparently the first and most northerly record for the species in Newfoundland. Previous to 1963 only two records were known from the Newfoundland Banks, one trawled at Whale Deep, March 1934;[20] one nearly 8 feet long, June 28, 1946, in lat 44°27′N, long 50°00′W.[47] However, Templeman[472] has provided 36 additional Newfoundland references. Other records: off Sable Island;[49] Bay of Fundy;[360] Passamaquoddy Bay, October 1935.[324] A fishery is carried on from southwest Grand Bank along the outer coast of Nova Scotia to Georges Bank. Although there are few positive records along the outer coast of Nova Scotia, the species is common as far north as St. Pierre Bank.

Biology and Economics: The eggs are hatched within the maternal oviducts; the young which are about 2 feet long are born during summer.

Porbeagle are pelagic, cruising along waters of the continental slope and at times farther offshore. They are sluggish when hooked. Food consists of herring, mackerel, cod, hake, cusk, flounders, squid, and probably other fishes.

This shark was formerly in demand in the United States for its liver oil. Currently an active fishery is conducted in Canadian waters principally by Norwegian fishermen, who are believed to have taken several million pounds in 1961. The price per pound averages about 15 cents.

Mako **Mako**

Isurus oxyrinchus Rafinesque 1810

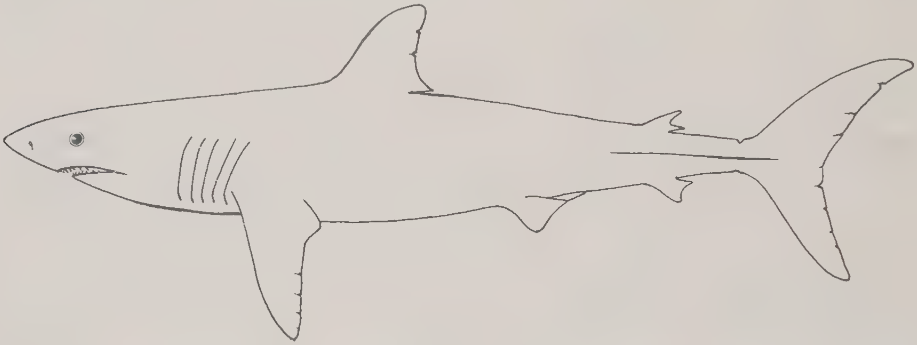
Other common names: sharp-nosed mackerel shark, mako shark

This species has only recently been reported to occur in the area by Tibbo et al.[489]

Description: Proportional measurements, in per cent of total length for the two specimens reported by Tibbo et al.,[489] a male and a female 189 and 213 cm total length, respectively, are given below: Snout length in front of: nostrils 5.0, 4.9; eye 6.7, 7.4; mouth 7.0, 6.0. Snout to origin of: pectoral 30.2, 27.7; first dorsal 34.2, 39.0; anal 84.2, 74.4; caudal 88.3, 82.3. First dorsal fin: vertical height 13.3, 10.1; base length 10.4, 9.2. Anal fin: vertical height 2.0, 2.1; base length 1.8, 0.9. Caudal fin: upper margin 25.7, 21.4; lower margin 18.8, 17.0; peduncle width 7.4, 9.5; peduncle depth 2.3, 2.4. Body at origin of pectoral: breadth 15.4, 12.8; depth 13.4, 11.9. Interspace between: first and second dorsals 29.9, 25.1; second dorsal and caudal 8.2, 8.6; anal and caudal 9.1, 7.6. Pectoral fin: length anterior margin 19.1, 19.0. Nostrils: distance between inner ends 4.0, 4.4. Eye: horizontal diameter 1.8, 1.5. Mouth: width 7.7, 7.4.

DISTINCTIONS: The single lateral keel on the caudal peduncle and the long narrow and curved teeth without lateral cusps are convenient aids to indentification. The porbeagle has two lateral keels and each tooth has one lateral cusp per side.

SIZE: Authentic lengths to about 12 feet have been reported but the Canadian captures have been only about half this size.



RANGE: In the western Atlantic from Georges Bank southward to the Gulf of Mexico and the Carribbean Sea.

Canadian distribution: This member of the family of mackerel sharks has only recently been recorded from this area of the northwest Atlantic by Tibbo et al.[489]

On August 5 and 8, 1962, two specimens, a male and a female, were taken on a surface longline set from the Fisheries Research Board of Canada's M.V. *Harengus* on the peak of Browns Bank (42°10′N lat, 65°40′W long). The lower jaws of these specimens are in the collections of the Royal Ontario Museum (cat. no. 22114).

Previous to these Browns Bank captures the northernmost record for the species was that reported by Scattergood [400a] for the Gulf of Maine—a specimen with an estimated weight of 400–450 pounds, harpooned in July 1957 off Boon Island, York County, Maine.

Family SCYLIORHINIDAE Cat sharks

This is a rather large family, better known in European than American waters. Most members of the family are slow moving and small, usually measuring less than 4 feet long. Body elongate, and tail hardly elevated; 5 gill slits; spiracles present; no nictitating membrane; teeth of more or less uniform shape in both jaws, each tooth with 2 small lateral cusps. Oviparous, the triangular horny egg case has a tendril at each corner.

Only one species has been recorded from Canadian waters.

Deepsea cat shark **Roussette de profondeur**

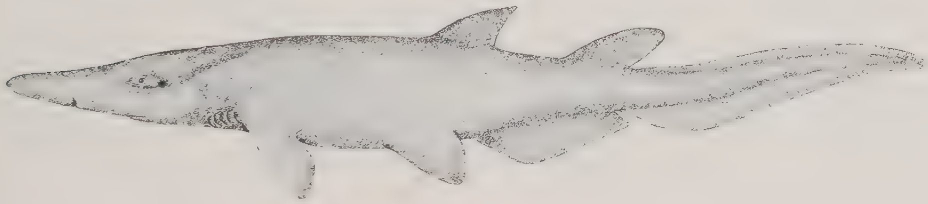
Apristurus profundorum (Goode and Bean) 1896

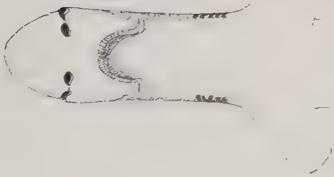
DESCRIPTION: Trunk slender, highest opposite axil of pectoral, tapering evenly rearward. Head flattened above and contracted laterally in front of outer ends of nostrils; snout broadly rounded. Eye oval, horizontal diameter about $\frac{3}{5}$ as great as distance between nostrils. Spiracle oval, diameter $\frac{1}{3}$ that of eye and posterior to it. Mouth ovate, on lower surface, teeth in 25–40 series in upper jaw and 25–41 in lower, each with long, sharp, median cusp, flanked on either side by 2–3 smaller cusps. Fins: dorsals (2), brush-shaped, with rounded tips and weakly convex anterior margins, origin of first dorsal about over mid-point of bases of pelvics, its base a little less than $\frac{2}{3}$ as long as snout, its rear tip about over origin of anal, second dorsal slightly larger than first, its base about equal to that of first, its origin about over mid-point of base of anal; no definite interspace between second dorsal and caudal, the latter about $\frac{1}{4}$ of total length, with rounded tip and weak subterminal notch, lower anterior corner subangular, its axis not raised appreciably above axis of trunk; no space between anal and caudal fins, the anal an equilateral and very obtuse triangle, with straight edges and rounded corners, its base twice as long as that of second dorsal; pelvics quadrate, with nearly straight edges and blunt corners; pectoral twice area of first dorsal, brush-shaped, outer margin nearly straight. Five short gill openings on either side, last 2 above base of pectoral, anterior outlines deeply concave, so that tips of gill filaments show.

Colour, grayish-brown.

DISTINCTIONS: This small shark can be distinguished from others in the area by the rearward position of the first dorsal fin, its origin being considerably posterior to the origin of the pelvics; the presence of an anal fin distinguishes it from the dogfishes.

SIZE: Largest known specimen is 24 inches long.





RANGE: Western North Atlantic on the continental slope from off southwestern Nova Scotia to off Delaware Bay. A species, that may prove to be identical, occurs off the Icelandic coast.

Canadian distribution: A few specimens were trawled in 1952 and 1953 at lat 42°39′N, long 63°54′W, i.e. off LaHave Bank and westward. All were caught in depths of 360 fathoms or more.[51, 54] Templeman[172] has reported the occurrence of egg cases thought to be of this species, that were taken off the southwest slope of Grand Bank, the southern slope of Haddock Channel, and off Sable Island.

Family CARCHARHINIDAE Requiem sharks (maneating sharks)

This is the largest of the shark families, containing a large number of essentially typical sharks of warm seas. Body elongate, the first dorsal fin being completely in front of pelvic fins, the second dorsal smaller than first and located over the anal fin; dorsal lobe of caudal fin much larger than lower, with a well-developed subterminal notch. Last gill slit usually located above pectorals; eyes with nictitating membranes; spiracles small or absent; teeth knife-like, often with well-developed lateral cutting edges, the shape of teeth useful in identification. Viviparous or ovoviviparous.

There are five species known to occur in Canadian waters.

Whitetip shark **Rameur**

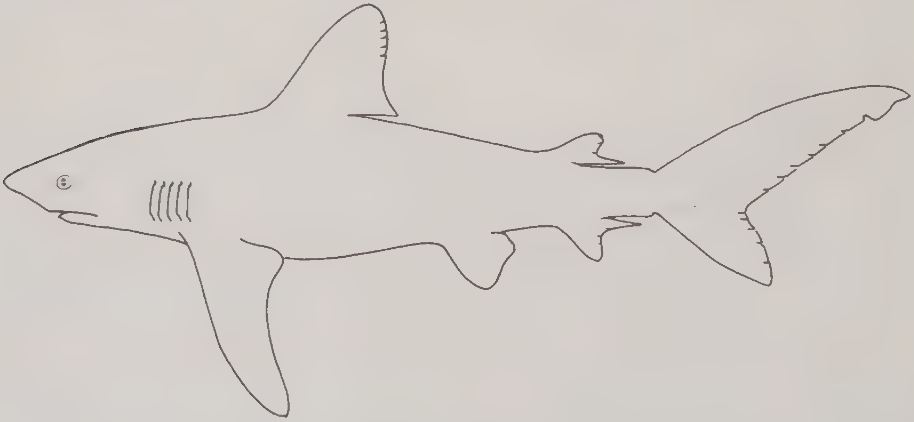
Carcharhinus longimanus (Poey) 1861

DESCRIPTION: The only specimen taken in our area was reported by Tibbo.[486] The following proportional dimensions, expressed in percentage of total length, are taken from Tibbo:[486] eye diameter 1.3, first dorsal base 10.3, second dorsal base 3.4, upper caudal lobe 28.2, lower caudal lobe 13.2, anterior margin pectoral 21.0, snout to first dorsal 31.6, and snout to second dorsal 64.0.

Colour, gray to brown above becoming dirty-white below.

DISTINCTIONS: The short, broad, round snout, distinctly flattened dorsoventrally, rounded apex of the first dorsal fin, the convex outline of the lower lobe of caudal fin and the white tips on dorsal, pectoral, and caudal fins will assist in the identification.

SIZE: A maximum size of about 11.5 feet has been given. The specimen described by Tibbo was a male about 7 feet 3 inches (221 cm) long.



RANGE: Tropical and subtropical Atlantic; on the west from Georges Bank southward to Uruguay but usually not north of the West Indies.

Canadian distribution: The whitetip shark has only recently been recorded from this area of the northwest Atlantic by S. N. Tibbo[486] under the name *Pterolamiops longimanus* (Poey). Tibbo reported the species on the basis of a capture of a male specimen near the eastern edge of Georges Bank (lat 41°01′N, long 65°54′W) on October 10, 1961. This capture is the most northern recorded for the species. The head is retained in the collection of the Royal Ontario Museum (cat. no. 22045).

Biology and Economics: The occurrence of this essentially warm water species so far north was attributed to the incursion of Gulf Stream water on to the eastern slope of Georges Bank as the result of a tropical hurricane.

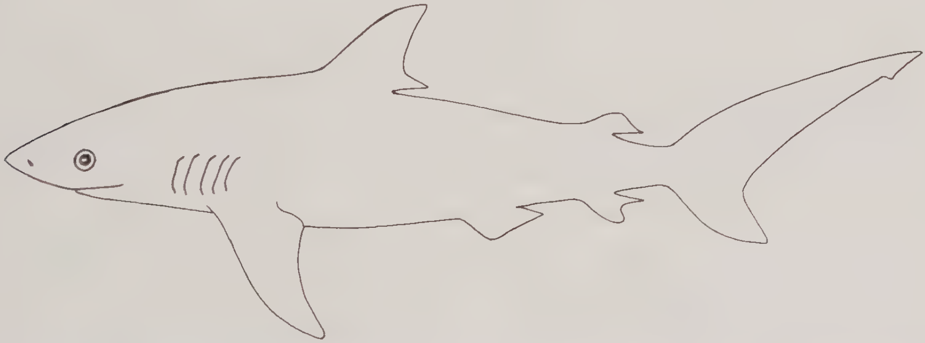
Dusky shark Requin obscur

Carcharhinus obscurus (LeSueur) 1818

Description: Proportional measurements in per cent of total length for one specimen, a male, 310 cm total length, recently captured on Georges Bank, are as follows: Snout length in front of: nostrils 5.7; eye 8.2; mouth 6.8. Snout to origin of: pectoral 23.0: first dorsal 34.0; anal 66.8; caudal 75.4. First dorsal fin: vertical height 9.6; base length 8.6. Anal fin: vertical height 3.1; base length (attached) 3.7; base length (to end free tip) 6.9. Caudal fin: upper margin 26.1; lower margin 12.3; peduncle width 3.0; peduncle depth 3.4. Body at origin of pectoral: breadth 13.1; depth 12.7. Interspace between: 1st and 2nd dorsals 23.8; 2nd dorsal and caudal 6.7; anal and caudal 5.3. Pectoral fin: length anterior margin 19.8. Nostrils: distance between inner ends 6.5. Eye: horizontal diameter 1.0. Mouth: width 10.0.

Colour, upper surface leaden or dirty-gray above; lower surface white or grayish-white.

Distinctions: The grayish colour of upper surface, broadly rounded and flat snout, ridge between first and second dorsal fins, the free part of the 2nd dorsal less than twice its vertical height and the absence of white tips on the fins will aid in distinguishing this species from other sharks in the area.



Size: Has been reliably reported to attain a length of 11 feet, 8 inches, but the specimens reported by Tibbo and McKenzie[488] ranged from about 10 feet (310 cm) to 10.5 feet (329 cm).

Range: In the western Atlantic from Georges Bank to Brazil.

Canadian distribution: Tibbo and McKenzie[488] reported the capture of four male specimens of dusky sharks from the Corsair Canyon region of Georges Bank, position lat 41°20′00″N, long 66°10′30″W. This would appear to be about the northern limit of range. The only previously known record from Georges Bank was that of Firth.[135]

The four specimens, all males, measured 310, 314, 317, and 329 cm total length and weighed 177, 209, 191, and 209 kg, respectively.

Smooth dogfish — Émissole

Mustelus canis (Mitchill) 1815

DESCRIPTION: Body slender, flattened below, tapering rearward from region of first dorsal fin. Snout tapering but blunt; head flattened above; mouth ventral, teeth small, flattened, in 5–7 rows. Eye oval, its horizontal diameter slightly less than the distance between the nostrils. Fins: dorsals (2), about equal in size, first dorsal originates just over rear edge of pectorals, second dorsal slightly smaller than first, inserted slightly in front of a perpendicular through the anal; caudal fin with upper lobe prolonged, deeply notched toward tip, lower lobe very small; anal about half height of second dorsal; pectorals slightly larger than first dorsal; a little longer than broad, triangular. Five short gill slits, fourth and fifth above base of pectoral fin.

Colour, upper surface olive to slaty-gray or brown; lower parts yellowish or grayish-white. Capable of changing colour slowly to suit background.

DISTINCTIONS: Can be distinguished from the other sharks of Canadian waters by the almost equal dorsal fins. Differs from the spiny dogfish by the absence of spines in front of dorsal fins and by the possession of an anal fin.

SIZE: Up to a length of about 5 feet.

RANGE: Coastal waters of the western Atlantic from Cape Cod to Uruguay, occasionally straying to the Gulf of Maine and the Bay of Fundy. Found at Bermuda.

Canadian distribution: Recorded only once. A specimen was taken in July 1913, in the St. Croix River near St. Andrews, N.B.[205]

BIOLOGY AND ECONOMICS: This species is a summer visitor at the northern part of its range. Its food consists of large crustaceans and small fishes and squid. It is known to eat lobsters and crabs.

The smooth dogfish is viviparous, from 10 to 20 young being produced at one time; they are 11–14 inches long when born.

Blue shark — Requin bleu

Prionace glauca (Linnaeus) 1758

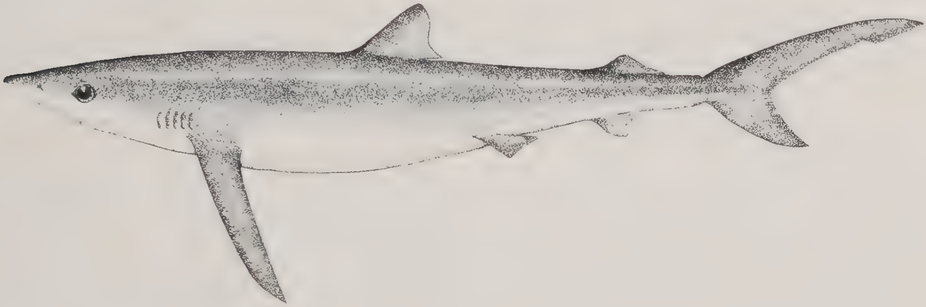
OTHER COMMON NAMES: blue dog

DESCRIPTION: Body slender, fusiform, thickest at about mid-length; caudal peduncle short, slender, without lateral keels, with well marked pre-caudal pits; snout long, tip rounded. Mouth ventral, teeth large, sharp-pointed, usually with finely serrated edges but occasionally some smooth-edged, outer teeth with convex and concave sides. Eye broadly oval, horizontal diameter ¼ to ⅕ as long as the snout in front of the mouth. Fins: dorsals (2), first moderate in size, situated about midway between the pectorals and pelvics and not above any part of either, second dorsal less than ½ as high as the first and immediately above the anal; caudal with upper lobe twice as long as the lower and conspicuously notched near the tip; anal small; pectorals sabre-shaped, narrow and very long, their length equal to twice the height of the first dorsal, whose posterior corner they will almost reach. Spiracles small or absent. Five short gill slits, the fourth and fifth above the base of the pectorals.

Colour, dark-blue along back shading to clear, bright-blue on sides; under surface white; tips of pectoral and anal fins dusky. Colours fade rapidly after death.

DISTINCTIONS: This shark may be recognized by its slender form, colour, and the long pectoral fins.

SIZE: Maximum length about 12 feet.



RANGE: Cosmopolitan, inhabiting the high seas in all the warmer parts of the Atlantic and Pacific oceans. From the Newfoundland Banks to Uruguay but not often taken near shore from New York to the West Indies. In the eastern Atlantic from southern Norway to South Africa, including the Mediterranean. In the eastern Pacific from California to southern British Columbia.

Canadian distribution: The blue shark at times is plentiful in the Canadian area but is seldom reported. Other than two records from Gaspé, Que., there are no records for the western North Atlantic north of St. John's, Nfld., although there are about eight Newfoundland records and Templeman[40, 472] has noted that the species is common near the Magdalen Islands in July and August. Reported from off Miminegash, P.E.I., in 1952; from St. Pierre Bank in August 1936;[313] at the southwestern end of the Grand Bank;[20] Banquereau in 1931;[17] Sable Island Bank;[498] plentiful off Halifax in August 1920, catches confined to large males.[49]

BIOLOGY AND ECONOMICS: This shark is pelagic and only visits our waters during the summer months. It is a warm water oceanic form that is possibly abundant south of the Grand Bank along the border of the Gulf Stream. Its chief food consists of small fishes such as herring and mackerel, that may be available. It will eat cod, haddock, and pollock when these are caught by fishing gear. It also takes squid and spiny dogfish and is a scavenger when opportunity offers. Despite its excellent teeth there are no reliable reports of it attacking swimmers. The blue shark is viviparous, females producing 30–50 young at one time.

Atlantic sharpnose shark **Requin à nez pointu**

Rhizoprionodon terraenovae (Richardson) 1836

DESCRIPTION: Body slender, highest at first dorsal fin, tapering in both directions. Snout varies in length and bluntness. Mouth ventral, teeth with triangular cusps, sharp-pointed, smooth-edged, those at the midline symmetrical, lateral ones pointing outward; labial furrow extending around the corners of the mouth and onto each jaw. Eye circular. Fins: dorsals (2), first rather high, its height about ½ the distance from the snout to the origin of the pectorals, situated just a trifle behind the base of the pectoral fins, second dorsal about ¼ as high as the first, its origin over the middle of the base of the anal; caudal about ¼ the total length of the shark, upper lobe about twice the length of the lower and deeply notched near end; anal a little larger than second dorsal; pectoral about as long as the length of first dorsal along its front margin.

Colour, brownish to olive-gray above; white below and along rear margins of pectorals; dorsals and caudal more or less dark-edged.

DISTINCTIONS: This shark can be identified by the shape and characters of the teeth and by the presence of well-marked labial furrows.

SIZE: Up to 3 feet in length.

RANGE: Both sides of the tropical and subtropical Atlantic Ocean. New Jersey to Uruguay on the western side; Morocco and the Cape Verde Islands on the eastern side. Occasionally at Woods Hole, Massachusetts.

Canadian distribution: A single stray specimen was collected by Verrill at Grand Manan, N.B., in 1857. It is preserved in the Harvard Museum of Comparative Zoology. Despite its scientific name, this shark has not been found at Newfoundland.

BIOLOGY AND ECONOMICS: In the south, where this shark is common, it is found along beaches and in estuaries, never far from shore. Its food consists of small fishes, shrimp, and molluscs.

Family SPHYRNIDAE Hammerhead sharks

This is a small family of sharks of peculiar shape, having head flattened and extended sideways producing a hammer-like or shovel-like appearance. The eyes are located at the lateral extremities of these lateral head extensions. There are 2 dorsal fins, the first located in advance of the pelvic fins, the second located over the anal fin; upper caudal lobe larger than lower. No spiracle, nictitating membranes present and with long, well-developed nasal grooves. Tooth shape varying in different regions of upper and lower jaws. Viviparous.

There is one species only in Canadian waters.

Smooth hammerhead **Requin-marteau commun**

Sphyrna zygaena (Linnaeus) 1758

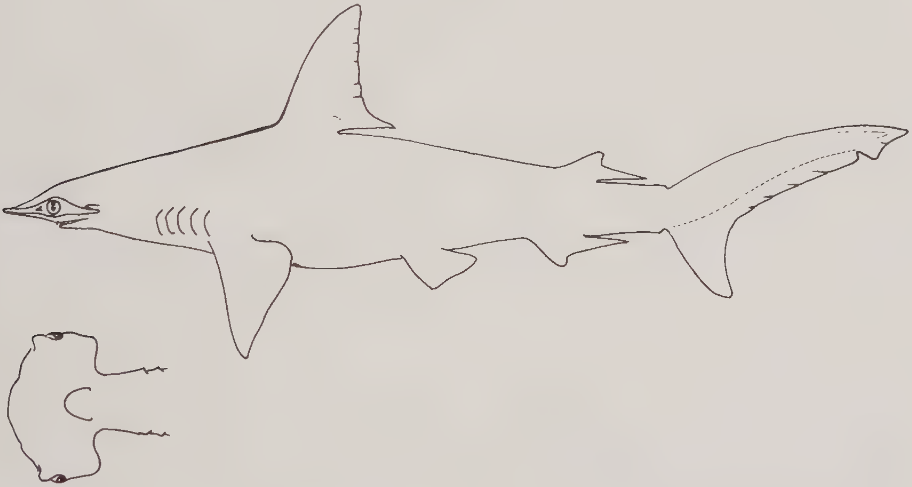
OTHER COMMON NAMES: common hammerhead

DESCRIPTION: Body strongly compressed, depth greatest in region of first dorsal; caudal peduncle strong, upper precaudal pit well developed. Head much flattened and expanded sidewise with eyes at outer edges of hammer-like expansions; front margin of head scalloped with deep depressions opposite each nostril. Mouth ventral, strongly arched, a very short labial furrow on lower jaw only; teeth triangular, uppers larger than lowers, cusps smooth-edged in young, becoming weakly serrated in older specimens. Eye a little broader than high. Fins: dorsals (2), first a little more than ½ the head length in height, sloping backward, its origin a little posterior to axil of pectoral, second dorsal small, origin about mid-point of base of anal, its free rear corner very slender; caudal ⅓ total length of shark, lower lobe about ⅓ as long as the upper; anal slightly larger than the second dorsal, rear margin deeply incised, free rear tip about as long as the base; pectoral about as long as the vertical height of first dorsal. Five gill slits, fifth over base of pectoral fin.

Colour, olive, leaden or brownish-gray above; paler on sides, shading to grayish-white below.

Distinctions: Readily distinguished from any other shark of these waters by the lateral projections of the head and shape of anal fin.

Size: Up to a length of 13 feet.



Range: Occurs in tropical to warm, temperate belts of the Atlantic and Pacific oceans and probably in the Indian Ocean. In the western Atlantic from southern New England to northern Argentina, straying north to Massachusetts Bay and Nova Scotia; in the eastern Atlantic from the English Channel to tropical South Africa.

Canadian distribution: There are only two definite Canadian records, both of small specimens between 20 and 21 inches long; one was caught in September 1932 in Halifax Harbour, N.S.[498] and the other in August 1938 at nearby Sambro Island.[504] A fully grown one was reported from off Brier Island, N.S., at the entrance to the Bay of Fundy many years ago but no details exist.[304] A 12-foot specimen was caught just outside Canadian waters in August 1928 in the channel between Georges and Browns Banks.[46]

BIOLOGY AND ECONOMICS: Pelagic, often swimming with upper parts of fins exposed. Their food consists chiefly of fishes including young sharks and rays. The young are born alive in litters of 30 or more.

Family DALATIIDAE Sleeper or gurry sharks

The sleeper or gurry sharks are large, slow-moving sharks, closely related to the family Squalidae and resembling that family in the general shape and disposition of the fins, except that the dorsal fins are without spines; no anal fin. Teeth in upper jaw unlike those in lower jaw.

One species in Canadian waters.

Greenland shark **Laimargue**

Somniosus microcephalus (Bloch and Schneider) 1801

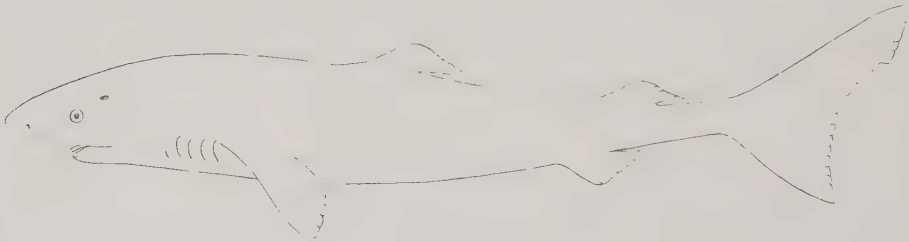
OTHER COMMON NAMES: sleeper shark, ground shark (Nfld.)

DESCRIPTION: Body subcylindrical anteriorly, but tapering towards the tail; caudal peduncle with an indistinct lateral, longitudinal ridge. Snout thick, fleshy, broadly rounded in front. Eye approximately circular, very small, its diameter equal to 1/5 length of snout. Mouth ventral, upper teeth thorn-like, tapering to a tip; lower teeth half as broad as high, cusp smooth-edged and deeply notched outwardly and so oblique that inner margins form an almost continuous cutting edge. Fins: dorsals (2), first dorsal the larger, with very sloping front edge, its origin about midway between tip of snout and origin of caudal, second dorsal slightly smaller, apex more broadly rounded, its origin over rear end of base of pelvics; caudal with subterminal notch, lower lobe 2/3 as long as upper lobe; pelvics slightly larger than second dorsal; pectorals larger than pelvics, with almost straight outer edge and moderately rounded tip. Five short gill slits, low on the neck, fifth just in front of base of pectoral.

Colour from various shades of gray, to almost black, back and sides crossed by numerous indistinct dark bands.

DISTINCTIONS: It is our only large shark lacking an anal fin. It may be distinguished from the spiny dogfish, the black dogfish and the Portuguese shark, by the absence of spines preceding the dorsal fins.

SIZE: Length up to 24 feet.



RANGE: Both sides of the North Atlantic. On the North American coast the Greenland shark occurs from Hudson Strait to Cape Cod; Baffin Bay and western

Greenland. On the European side of the Atlantic it is found from the White Sea to the southern part of the North Sea. The same species, or a closely related one, occurs from northern Alaska to California in the northeastern Pacific.

Canadian distribution: Templeman[172] has noted that the Bigelow and Schroeder[49] reference to the Storer[455] record of Bradore was probably not the Bras d'Or of Cape Breton but Bradore, Quebec, on the North Shore of the St. Lawrence. An 11-foot specimen was recorded off Halifax in 1863.[232, 513] Since then it has been reported frequently from Wakeham Bay and Ungava Bay and along the coast of Labrador generally.[124, 451, 496] A 16½-foot specimen was caught in March 1934 on the western part of the Grand Bank.[20] It has been taken in the northern Gulf of St. Lawrence in the Saguenay River and at Métis, P.Q.[107, 527] Two specimens were caught in 1915 in Passamaquoddy Bay and at Campobello Island in the southwestern Bay of Fundy area.[205]

BIOLOGY AND ECONOMICS: This shark is very sluggish and offers little resistance when captured. It occurs at the surface and close to the coast, especially in winter but during the summer occurs in deeper, cooler waters.

The Greenland shark eats a wide variety of fishes including herring, salmon, capelin, redfish, sculpins, lumpfish, cod, haddock, pollock, halibut and other flatfishes, skate, etc. It also eats seals, sea birds, squid, crabs, and even jellyfish. It is attracted to places where sealing or whaling operations are in progress and eats any discarded parts.

It is thought that the Greenland shark deposits its eggs in the mud but evidence is still insufficient to support this theory. No embryos have been found in females.

In Greenland and Northern Europe the Greenland shark has been fished for the liver oil and as food for dogs. The annual catch in West Greenland has been estimated to be of the order of 50,000 individuals, prior to 1948. No commercial use has been developed in North American waters.

Family SQUALIDAE — Dogfish sharks

Although typically a family of small sharks of inshore waters, some species inhabit deep waters and are not well known. Body elongate, with 2 dorsal fins, each with a spine at the origin, the spine sometimes not obvious; no anal fin. Spiracles present, no nictitating membrane, teeth of one or more cusps and variable. Ovoviviparous.

Four species occur in Canadian waters.

Black dogfish — **Aiguillat noir**

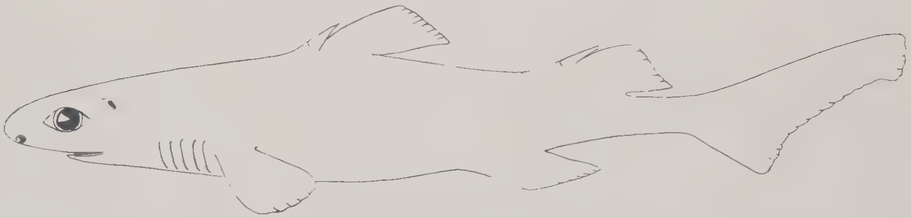
Centroscyllium fabricii (Reinhardt) 1825

DESCRIPTION: Body slender; snout short, bluntly rounded; caudal peduncle without longitudinal ridges or precaudal pits. Mouth ventral, evenly arched, teeth with 3 or more cusps, the middle one longest, upper and lower teeth similar. Eye oval, large, about ⅔ the length of the snout in front of mouth. Fins: dorsals (2), each preceded by a stout spine, deeply grooved on each side, the spines less than half the length of front edge of respective fins, first dorsal smaller than second; caudal not distinctly lobed but upper edge twice length of lower edge, upper portion truncated and divided from lower part by a shallow subterminal notch; no anal fin; pelvics equal to second dorsal in size, their origins a little before that of the second dorsal; pectorals small, truncated, inserted well ahead of first dorsal. Five short gill slits, all in front of base of pectoral fin.

Colour, deep-brown to black above; almost black below and on fins.

DISTINCTIONS: The absence of an anal fin distinguishes the black dogfish from most of the sharks. It may be distinguished from the spiny dogfish by the presence of the subterminal notch on the tail, by the deeply grooved dorsal spines, by having the pelvic fins partially below the second dorsal fin, by the shape of the teeth, and by the dark colour.

SIZE: Average size varies from 23.8 to 29.5 inches (60–75 cm); few are larger than 31.5 inches (80 cm). Largest specimen reported by Templeman[472] was 33.0 inches (84 cm).



RANGE: Both sides of the North Atlantic Ocean and in Davis Strait, western Greenland and Iceland; possibly in the North Pacific in Japanese waters. In the western Atlantic from the slopes of the Grand Bank to those off Georges Bank; in the eastern Atlantic off the Faroes, Shetlands, and Hebrides.

Canadian distribution: Templeman[472] has reported the species numerous in trawl captures southeast and centrally along the seaward slope of the Scotian shelf northward to St. Pierre Bank, Grand Bank, Flemish Cap, Labrador shelf, and Hamilton Inlet Bank, to a northernmost limit on Baffin Island shelf, lat 65°12′N, long 58°13′W, where 3 specimens were taken in 410–420 fathoms on August 26, 1959. Reported from near the southern tip of St. Pierre Bank in 90–150 fathoms in the spring of 1950.[5] Several were caught in November 1953, from 200 fathoms in the Laurentian Channel, west of Cape Anguillo, Nfld.[253] Over 100, of sizes from six inches up, were caught off southwestern Nova Scotia in June 1949 in 290–580 fathoms.[49]

BIOLOGY AND ECONOMICS: The black dogfish is caught at the surface as well as at great depths off West Greenland but is limited to deep waters off the Canadian coast, being caught on halibut lines and in otter trawls. From May to November most are caught at depths of 250 fathoms or deeper. The stomachs of specimens from West Greenland contained squid, pelagic Crustacea, and jellyfish.[49]

Portuguese shark **Pailona**

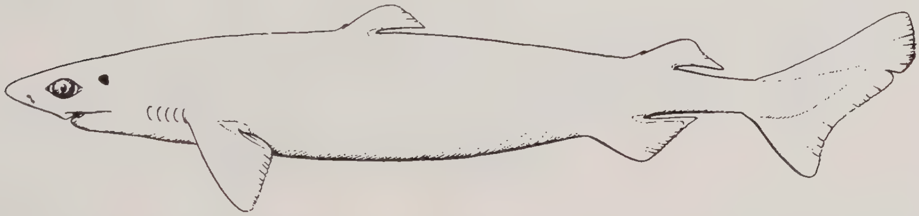
Centroscymnus coelolepis Bocage and Brito Capello 1864

DESCRIPTION: Body subcylindrical, moderately stout, deepest at first dorsal fin, caudal peduncle without lateral ridges or precaudal pits. Snout short, blunt. Eye oval, horizontal diameter ½ length from mouth to tip of snout. Mouth ventral, upper teeth slender, with one lanceolate cusp; lower teeth markedly different, with one broad cusp, strongly oblique so that inner margins of teeth form an almost continuous cutting edge. Fins: dorsals (2), first small, base length and height about ¼ head length, second dorsal slightly larger, its origin a little behind the mid-point of the base of the pelvics, each dorsal preceded by a short, somewhat concealed spine; caudal truncate posteriorly, with a deep subterminal notch, its front lower margin slightly more than half as long as the front upper margin; pelvics slightly larger than the second dorsal; pectorals slightly larger than pelvics, with well-rounded corners. Five short gill slits, all in front of base of pectorals.

Colour, dark chocolate-brown throughout.

DISTINCTIONS: The absence of an anal fin separates it from most sharks. It can be distinguished from the spiny dogfish and the black dogfish by the shortness of its dorsal spines and by the dissimilar teeth in the 2 jaws. Its dorsal spines separate it from small Greenland sharks which it otherwise resembles.

SIZE: Length up to 4 feet.



RANGE: Both sides of the North Atlantic Ocean. From the slopes of the Grand Bank to off Massachusetts in the west. At Iceland, Faroes, south to the Azores, and Morocco and also in the Mediterranean. Reported from Japan.

Canadian distribution: From the slopes of Banquereau in 180–260 fathoms;[35, 513] from slopes of Grand Bank and LaHave Bank.[47] This species is considered to be rare in Canadian waters at least above 400 fathoms, for Templeman[472] reports that in 10 years trawling not one specimen has been captured. Templeman also casts doubt on the location "42°15′N, 58°52′W 250 fm" given by Bean[35] for one record since he notes that the depth at that location is much greater than 250 fathoms. Taken infrequently.

BIOLOGY AND ECONOMICS: This small shark is only taken in depths of more than 180 fathoms, usually on halibut lines. It is said to be sluggish and to eat small fishes. Females have been found containing up to 16 embryos.[47]

Rough sagre — Sagre rude

Etmopterus princeps Collett 1904

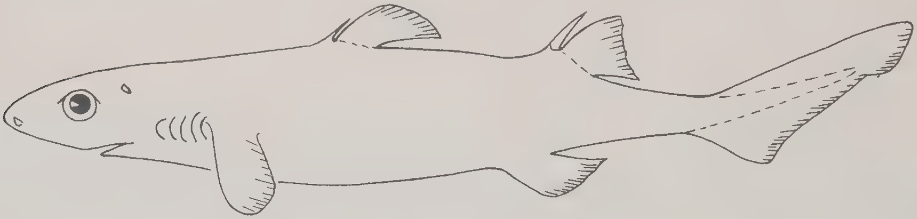
DESCRIPTION: Body slender, moderately compressed from pectorals to tail, deepest at first dorsal fin. Head flattened above, noticeably broad; snout thick and fleshy, low, wedge-shaped. Mouth ventral, nearly straight; teeth in 29–32 series in upper jaw, 40–50 series in lower jaw, upper teeth usually with 5 cusps in adults, median cusp largest, lower teeth with single cusp directed outward so that inner margins of successive teeth form a cutting edge. Eye about

2½ times as long as high. Spiracle ⅓ as long as eye, situated just posterior to it. Fins: dorsals (2), each preceded by a heavy spine, base of first dorsal about ⅓ length of interspace between dorsals, inserted considerably behind pectorals, base of second dorsal 1½ times as long as base of first, inserted behind pelvic fins, spine before second dorsal about twice length of that before first dorsal; caudal about as long as head, without distinct lower lobe, upper branch with definite subterminal notch; base of pelvics a little longer than base of second dorsal; anterior margin of pectorals nearly straight, distal end and posterior margin moderately rounded. Claspers of mature males moderately stout, attached to pelvic fins nearly to tips of latter and extending slightly beyond. Five short gill slits in front of base of pectoral; anterior margins of first three so concave that tips of gill filaments are exposed.

Colour of trunk very dark-brown or black, under side as dark or darker than upper parts; fins about as dark as trunk; rear lower corner of second dorsal with whitish area; anterior surface of gill slits whitish.

Distinctions: This small shark may be distinguished from others in this area by its uniform dark colour, combined with a prominent spine in front of each dorsal and with 5-cusped teeth in upper jaw and single-cusped teeth in lower jaw. It differs from the black dogfish (*Centroscyllium*) which has lateral grooves in the spines and several cusps on the lower teeth.

Size: The largest specimen on record is about 30 inches long.



Range: Known from both sides of the North Atlantic. In the west it occurs off southern Nova Scotia, off Georges Bank, and southern New England. In the east it has been caught in the region of the Faroes and Hebrides and off the Straits of Gibraltar in depths of 1100 fathoms.

Canadian distribution: Off LaHave Bank and southern Nova Scotia, at lat 42°39′N, long 63°38′W and westward, in depths of over 300 fathoms. Some 27 specimens were trawled there in 1952 and five more were taken in this region in 1953.[51, 54] In 1959 two further specimens were collected from about the same region.

Spiny dogfish — Aiguillat commun

Squalus acanthias Linnaeus 1758

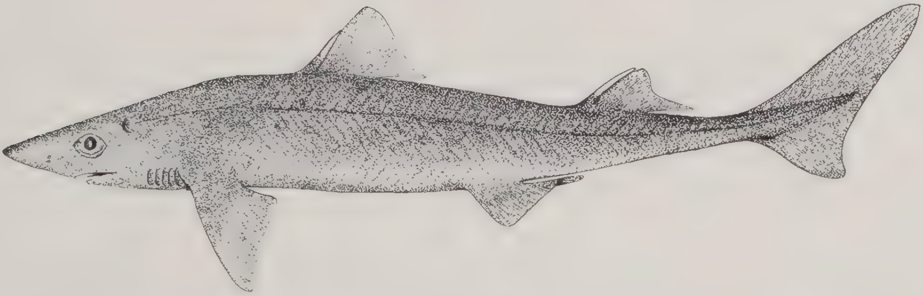
Other common names: dogfish, grayfish, aiguillat

Description: Body slender, rounded, deepest in front of first dorsal. Head flattened somewhat, snout blunt. Mouth ventral, teeth small, each with a single point directed towards outer corners of mouth, similar in both jaws. Eye oval. Fins: dorsals (2), each preceded by a sharp, heavy, fixed spine; first dorsal behind a perpendicular through the back of the pectoral, its spine about ½ the length of front margin of fin; second dorsal smaller, its spine almost as long as the front margin of the fin; upper lobe of caudal without subterminal notch, lower lobe about ½ the length of the upper one; no anal fin; pectorals large, roughly triangular. Five short gill slits in front of base of pectoral fin. Spiracle close behind eye. Adult males with claspers.

Colour slaty-gray above, sometimes tinged with brown, pale-gray to pure white below; a row of irregularly arranged small white spots from above the pectorals to the pelvics and a few similar spots near the dorsal fins.

DISTINCTIONS: The dogfish can be distinguished from all the larger sharks, except the Greenland shark, by the lack of an anal fin, and from the Greenland shark by the spines before the dorsal fins. Its single-pointed teeth, colour, and lack of a subterminal notch on the caudal separate it from the black dogfish and from the Portuguese shark.

SIZE: To a maximum length of 4 feet for females and 3 feet for males.



RANGE: Both sides of the North Atlantic, chiefly in temperate and subarctic waters. From southern Labrador to North Carolina, straying to Florida and Cuba. Reported sparingly from southwestern Greenland. In the eastern Atlantic from southern Scandinavia to Morocco, including the Mediterranean and the Black Sea. The dogfish of the North Pacific is now regarded as being of the same species.

Canadian distribution: Recorded near Domino Point, in southern Labrador, but not at Hamilton Inlet or farther north. It occurs in some quantity almost everywhere around Newfoundland, including both sides of the Strait of Belle Isle.[209, 462] Abundant in the southern Gulf of St. Lawrence, but less so at Chaleur Bay and Gaspé; recorded from L'Islet, Quebec.[39] Abundant along the Nova Scotia coast and in the Bay of Fundy. Found on all of the offshore banks including St. Pierre and Grand Bank and to the edge of the continental shelf.

BIOLOGY AND ECONOMICS: The dogfish appears seasonally in our waters. It arrives in Nova Scotia and in the Bay of Fundy in June, in the Gulf of St. Lawrence in July, and on the east coast of Newfoundland in July and August. It reaches Labrador in August or early September. Peaks of abundance are reached a few weeks later. The spiny dogfish leave first in the north and somewhat later farther south. All are gone by November or December. They winter offshore, off the lower New England States and farther south. Dogfish have been washed ashore in southern Newfoundland in January after severe storms; this suggests that some may winter in deep water nearby. In general dogfish do not appear until the water temperature reaches 42 F and they leave if it rises above 60 F. Spiny dogfish, tagged on the east coast of Newfoundland, moved in various directions at speeds of 6–7 miles per day. One such fish was caught at Cape Ann, Massachusetts, in the late fall of the same year, one was caught there a year later, and some were caught in the Gulf of St. Lawrence a year later. A small number of fish was tagged but showed wide movement.[462]

The young are born alive at lengths of from 9 to 13 inches. Careful studies have shown that the eggs are fertilized in the oviducts between February and June and the resulting embryos are carried by the female for 1½ to 2 years. They are born when the dogfish are offshore in winter; small, recently born ones are not seen in Canadian waters. Litters usually contain from 4 to 6 young. Growth studies, based on observation and calculation, indicate that males mature in 4–5 years and females in 7–8 years.

Spiny dogfish are voracious and eat a variety of animals including herring, mackerel, cod, pollock, salmon, menhaden, silver hake, squid, whelk, amphipods, shrimp, crabs, polychaete worms, and even jellyfish. In Newfoundland waters in July they feed chiefly on capelin.[462]

This species has at present only a negative value in the western Atlantic. They cause loss of gear and loss of fishing time for other species. They destroy both fish and nets set for herring, salmon, and mackerel. They frequently cause cessation of fishing for cod and haddock through taking the baits or being caught themselves in such numbers that the gear is useless for catching desired species. With greater use of trawlers or draggers this effect is becoming less pronounced but is important in some areas.

Attempts to process dogfish by canning, or reduction to oil and meal or fertilizer have not been successful as yet.

Order HYPOTREMATA (Rajiformes, Batoidei)—Rays

This is an order of medium size containing approximately 325 species classified in about 47 genera, in some 16 families and 2–5 suborders. These are bottom-living, cartilaginous fishes distinguished from the sharks (order Pleurotremata) in the following way: by being conspicuously flattened dorso-ventrally, by having five pairs of gill slits on the lower surface of the body (whence the name Hypotremata—"lower holes"), the pectoral fin is attached to the side of the head lending it a wing-like appearance and the eyeball is attached to the upper margin of the orbit; the teeth are bluntly pointed or flat and in many rows quite unlike the sharp cutting teeth of sharks; a pair of well-developed spiracles is usually present, located on top of the head. Breathing is accomplished by inhaling through the spiracle and expelling the water through the gills. The body is generally disc-like, with a well-developed tail posteriorly (see Fig 4). Most species are oviparous, laying eggs enclosed in four-cornered or rectangular horny cases or capsules, but some species bear living young (ovoviviparous).

Although the terms "skate" and "ray" are frequently used as if they were synonymous, the term "skate" is usually restricted to the members of the family Rajidae, while "ray" is a general term, applicable to all members of the order and is, thus, equal in scope to the word "shark."

The rays present a bewildering array of body shapes, only a few of which occur in our waters. Although more abundant in tropical and subtropical waters, they occur in all the oceans, some species penetrating into deep seas and others moving in estuaries of rivers and even swimming many miles upstream. Swimming is accomplished by wave-like undulations of the broad pectoral fins, the result being a kind of underwater flight which is not only a most efficient form of locomotion, but a pleasing spectacle. The mantas or devilfishes, which may exceed a ton in weight and a width of 20 feet, are the largest of the rays and indeed are large fishes by any standard. There are also rays with electric organs capable of producing shocks of considerable intensity, rays with serrated, poisoned spines on the tail, others with long sword-like snouts or rostra having a row of large teeth arranged on either side of this snout (sawfishes).

Only 14 species of rays, classified in four families, occur in Canadian waters.

KEY to Order HYPOTREMATA—Rays

1 A distinct caudal fin present in addition to 2 obvious dorsal fins; tail or caudal portion thick and short; skin soft, naked and smooth .... Atlantic torpedo, *Torpedo nobiliana* (p. 67)

No distinct caudal fin; dorsal fin present or absent (stingray); body and tail with small or large tubercles 2

2 No dorsal fin on tail or body; tail long, thin, and with 1, 2, or 3 long, well-developed, serrated spines on the dorsal surface, nearer the origin than the tip; tail with thorny tubercles ... Roughtail stingray, *Dasyatis centroura* (p. 64)

One or 2 dorsal fins on distal or proximal portion of tail 3

3 Tail thin, whip-like and with one dorsal fin on proximal portion; body with 2 fins on front of head, projecting forward like ears or horns (cephalic fins) .... Atlantic manta, *Manta birostris* (p. 66)

Tail not whip-like and with 2 dorsal fins on distal portion; body without cephalic fins; body and tail with small or large spiny tubercles (Rajidae) 4

4 Dorsal fins separate at base; anterior outline of snout usually pointed with angle of less than 90° (*R. radiata* has angle about 110°) 5

Dorsal fins joined at base; anterior outline of snout obtuse or blunt, 90° or greater 9

5 Mucous pores on ventral surface marked with black pigment lending blotchy appearance; no large thorns on back; tail with 3 rows of large spines .... Barndoor skate, *Raja laevis* (p. 55)

Mucous pores on ventral surface not marked with black pigment; thorns on back large and/or small; large spines along dorsal midline of tail 6

6 No more than 10 large spines along tail posterior to axils of pelvic fins; snout outline blunt (angle about 110°); teeth in 36–46 rows .... Thorny skate, *Raja radiata* (p. 59)

More than 10 spines along midline of tail posterior to axils of pelvic fins; snout usually less than 90° 7

7 No large spines on body; large spines on midline of tail only, 21–26 in number, posterior to axils of pelvic fins .... Spinytail skate, *Raja spinicauda* (p. 63)

Large spines on midline of body and tail and about eyes 8

8 Twenty-four to 31 large spines along midline of body and tail from nape to first dorsal fin; teeth in 56–66 rows .... Jensen's skate, *Raja jenseni* (p. 54)

Forty-seven to 51 large spines along midline of body and tail from nape to first dorsal fin; teeth in 47–50 rows .... White skate, *Raja lintea**

9 Lower surface of disc almost uniform dark brown, darker than upper surface. .... Abyssal skate, *Raja bathyphila**

Lower surface of disc light in colour, usually white; upper surface distinctly darker than lower surface 10

10 A distinct row of spines originating at nape and extending along midline of body and tail, body otherwise has mainly small spines 11

No distinct row of spines along midline of body and seldom on midline of tail; body otherwise with small and/or large spines 13

11 Spines along midline of body and tail diminishing in size posteriorly, becoming more or less indistinguishable at ⅔ distance from origin; tail with small spines or prickles only; spines more prominent on young but these have 1 or 2 conspicuous pale crossbars on tail near base; snout blunt, having an angle of greater than 90° .... Smooth skate, *Raja senta* (p. 61)

Spines along midline of body and tail, well developed and conspicuous but not obviously diminishing in size posteriorly 12

12 Snout blunt, having an angle greater than 90°; males attain length of about 21 inches (Gulf of St. Lawrence and southward) .... Little skate, *Raja erinacea* (p. 51)

Snout sharp, having an angle of less than 90°; males mature at about 38 inches (Northern Labrador and Greenland waters) White skate, *Raja lintea**

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* Detailed accounts not presented for these species.

13 Body generally with only small spines or prickles but a large spine in front of each eye and spiracle and 1 or 2 on each shoulder; tail generally without large spines; teeth in 54–56 rows .... Soft skate, *Raja mollis* (p. 57)

Generally with large and/or small spines on body and tail, body without unique row of midline spines; tail generally with some well-developed and conspicuous spines 14

14 Teeth in upper jaw in 30–38 rows; tail usually with a series of rows of large spines extending onto the body; tail long, from centre of cloaca to tip 1.3 to 1.6 times as great as the distance from centre of cloaca to snout; tail even longer in young .... Round skate, *Raja fyllae* (p. 53)

Teeth in upper jaw in more than 38 rows (38–110); tail spines variable but not usually in midline (except in young of *erinacea*); tail length from centre of cloaca to tip 1.3 times or less than the distance from centre of cloaca to snout 15

15 Teeth in upper jaw in 38–64 rows, usually less than 54; males mature at length of 16–18 inches .... Little skate, *Raja erinacea* (p. 51)

Teeth in upper jaw in 72–110 rows, usually 90–100; males mature at length of 26 inches or more .... Winter skate, *Raja ocellata* (p. 58)

Family RAJIDAE Skates

This is a large family of about nine genera and many species of bottom-living rays, occurring in the relatively shallow waters of temperate and cool seas and in deeper waters in the tropics. The body is thin especially toward the outer margin; the tail long with longitudinal lateral folds, depressed in cross section, having one or two small caudal fins on the posterior portion. The surfaces of the body and tail are variously covered with large or small thorn-like scales. The species are oviparous, the eggs being deposited in rectangular horny capsules.

At least 10 species are known to occur in Canadian waters.

Little skate Raie hérisson

Raja erinacea Mitchill 1825

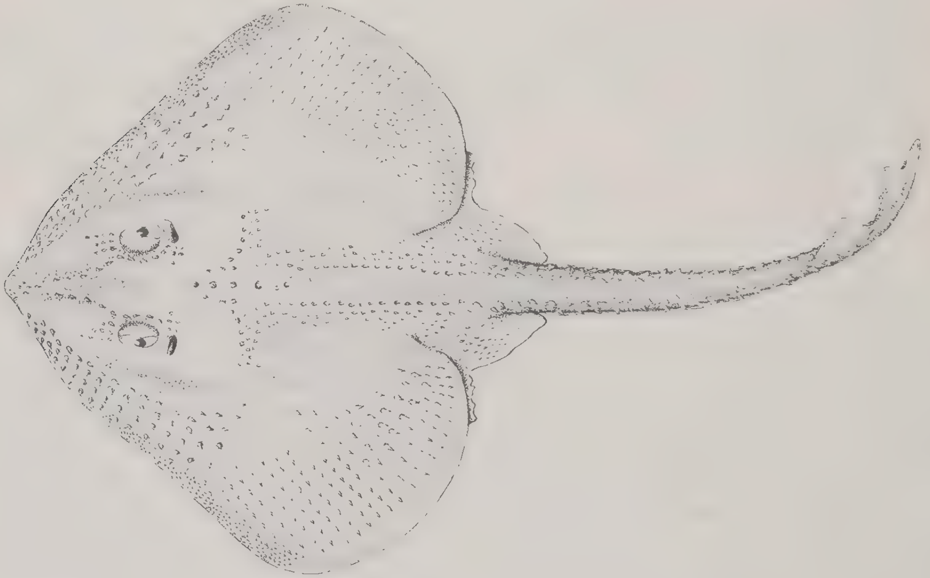
OTHER COMMON NAMES: tobacco box

DESCRIPTION: Body depressed, tail slender; disc about 1.2 times as broad as long, very obtuse in front; outline of disc between tip of snout and tip of pectoral fin slightly concave anteriorly, then convex in females and concave in males, outer and posterior corners broadly rounded. Tail with narrow lateral folds low down on posterior two-thirds; distance from centre of cloaca to tip of tail 1.2 to 1.35 times the distance between cloaca and snout. Upper surface, especially in females, rough with thorns and patterned somewhat as follows: 2–4 irregular rows of thorns on either side of the midline of the disc and on front part of tail, an irregular triangular group of 30–60 covering the neck and shoulder region, 3–8 thorns behind the eye and 8–15 in front of it, 9–12 along inner margin of orbit and several between orbits; young specimens have a row of strong median spines, usually lost when the fish reaches a length of 12 inches. Some spines on lower surface in snout region, otherwise the under side is smooth. Spiracle close behind eye. Mouth ventral, blunt teeth in 38–64 series in both jaws. Fins: first and second dorsals located near end of tail, their bases joined; caudal fin small; pelvic fins overlapped by pectorals and divided into anterior and posterior lobes. Claspers of mature males reach about midway from axil of pelvics to tip of tail.

Colour of upper surface grayish to dark-brown, usually with small, round or oval darker spots; lower surface white or pale-gray.

DISTINCTIONS: This species can be distinguished from *Raja ocellata* by having less than 66 series of teeth, whereas *R. ocellata* always has at least 72 series. It can be separated from other Canadian Atlantic skates by its very obtuse-angled snout.

SIZE: Up to 21 inches in length.



RANGE: The range of the little skate is limited to the western North Atlantic, from the southern Gulf of St. Lawrence to North Carolina.

Canadian distribution: The little skate, of common occurrence, has been reported from Gaspé;[450] Prince Edward Island;[50] southern Gulf of St. Lawrence;[203] outer coast of Nova Scotia,[513] and from the Bay of Fundy and St. Mary Bay, Nova Scotia.[205] It has not been reported from offshore Canadian banks but its occurrence on Georges Bank makes it probable that some of the skates caught on Sable Island and other Banks belong to this species.

BIOLOGY AND ECONOMICS: This skate is usually found on sandy or gravelly bottom in shallow water but young ones have been reported down to 50 fathoms in the Bay of Fundy. It moves into somewhat shallower water in summer but tolerates a wide range of temperature (33–70 F).

Fertilization is internal but eggs are laid throughout the year in large, tough, somewhat rectangular pouches, about 2½ inches long and 1¼ inches wide, with long horns extending from each corner. When released from the egg case, the young skates are 3–4 inches in length.

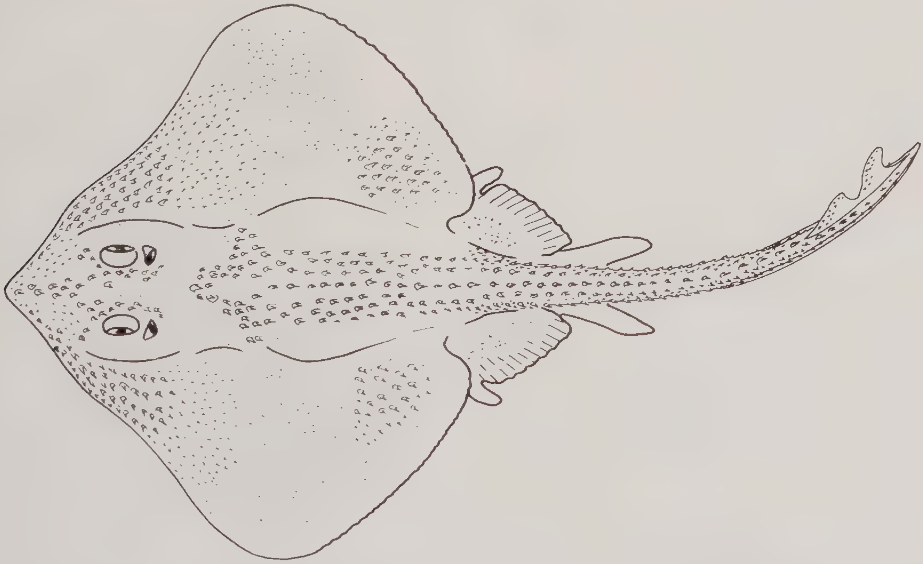
Food of the little skate consists of hermit and other crabs, shrimps, amphipods, annelid worms, bivalve molluscs, and some fishes such as sand lance, herring, cunner, alewives, tomcod, and flounders.

While large numbers of this species are caught by line trawls, otter trawls, and traps, little use is made of them except as a component of fish meal.

Round skate — Raie ronde

Raja fyllae Lütken 1887

Description: Body depressed, tail slender; disc about 1.2 times as broad as long, angle in front of spiracles 115–125°, front edge of disc sinuous, outer and posterior corners broadly rounded. Tail with lateral folds on terminal ⅓; length from centre of cloaca to tip of tail 1.3 to 1.6 times the length from tip of snout to cloaca. Typical adults are thorny along whole mid-dorsal belt of disc as well as along upper surface of tail, but some are thornless on mid-back just posterior to shoulder region; additional large thorns develop over shoulder region, around orbits and in 2–3 irregular rows between eyes and snout; outer posterior margins of pectorals remain smooth but anterior marginal regions become conspicuously thorny with age; a patch of large thorns develops on inner posterior portion of pectorals in females but not in males; no thorns on pelvics but upper surface is prickly with small spines; lower surface smooth. Thorn pattern quite variable. Spiracle behind and outwards from eye. Mouth ventral; teeth in 30–38



series with blunt, conical cusps, except in mature males where cusps are sharp. Fins: dorsals (2), bases confluent, near end of tail, upper parts prickly; caudal membrane confluent with second dorsal; pelvics with anterior lobe finger-like, posterior lobe weakly scalloped. Claspers in mature males extend half way from axils of pelvics to first dorsal fin.

Colour of upper surface ash-gray to chocolate-brown, uniform or shaded, females sometimes with a whitish blotch between the eyes and on inner, posterior part of pectorals; lower surface white to gray, with sooty patches on pelvics and rear of pectorals.

DISTINCTIONS: This skate can be distinguished from *R. erinacea* and *R. ocellata*, which it resembles, by its noticeably longer tail. There is danger of confusing young *R. fyllae* with young *R. senta*; the colour of the tail is plain in the former but has pale crossbars in the latter. The number of series of teeth in the jaws is valuable in distinguishing this species.

SIZE: The greatest recorded length is 21 inches.

RANGE: This species occurs on both sides of the North Atlantic, but is more common on the eastern side, where its range extends from the Barents Sea, Bear Island, Spitzbergen, Murman coast to Norway, and Denmark. It is found off Iceland and in Davis Strait, off West Greenland and on the slopes off Nova Scotia and Georges Bank.

Canadian distribution: Recent trawling in 1952 and 1953 obtained 29 specimens offshore from LaHave to Browns Bank in depths from 290 to 600 fathoms. These were taken between long 63°47′W and long 65°06′W.

Jensen's skate **Raie de Jensen**

Raja jenseni Bigelow and Schroeder 1950

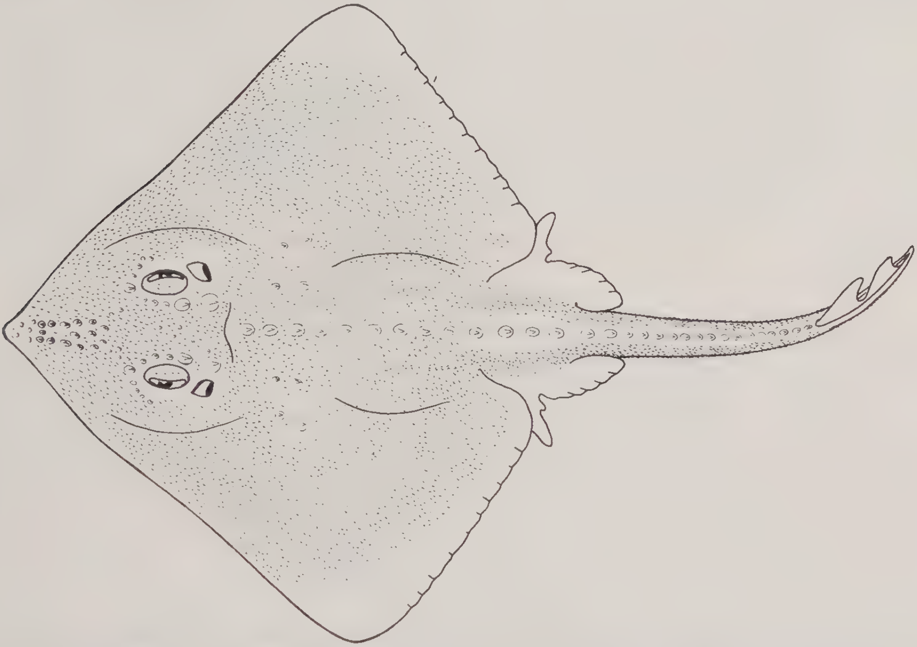
DESCRIPTION: Body depressed, tail slender; disc about 1.4 times as broad as long; maximum angle in front of spiracles about 110°; front edge of disc sinuous, outer corners abruptly rounded, posterior corners more broadly rounded. Tail with moderately broad lateral folds along its entire length; length from centre of cloaca to tip of tail about 75% of distance from tip of snout to cloaca. A median row of 24–31 large thorns from the nuchal region to the first dorsal fin, becoming smaller and more crowded along tail; 2–4 large thorns on each shoulder; one large thorn on inner side of each spiracle, 2–3 along inner margin of each eye; in small specimens there are small thorns on ridge between eyes and snout and between the eyes which are lost in older specimens. Lower surface smooth. Spiracle close behind eye. Mouth ventral, teeth in 56–66 series in both jaws, sharp-pointed. Fins: dorsals (2), about equal in size, near end of tail, their bases separated and fins with pointed rear corner; caudal low; pelvics deeply indented.

Colour of upper surface light grayish-brown, darker along margins of fins; lower surface white or yellowish to gray.

DISTINCTIONS: This skate can be distinguished by the short tail, thorn pattern, and the number of rows of teeth in each jaw.

SIZE: Up to a length of 33 inches.

RANGE: Jensen's skate is known only from a limited part of the western North Atlantic from off Halifax, N.S., to off Delaware Bay in from 200 to 1200 fathoms.



Canadian distribution: A single specimen was taken many years ago a little north of lat 42°37′N, long 62°55′W in 200 fathoms, and preserved in the United States National Museum.[48] A second specimen was taken in 1953 on the slopes of Browns Bank (lat 42°19′N, long 64°59′W) in 390–440 fathoms.[51] It is found in deep water; otherwise its habits are unknown.

Barndoor skate — Grande raie

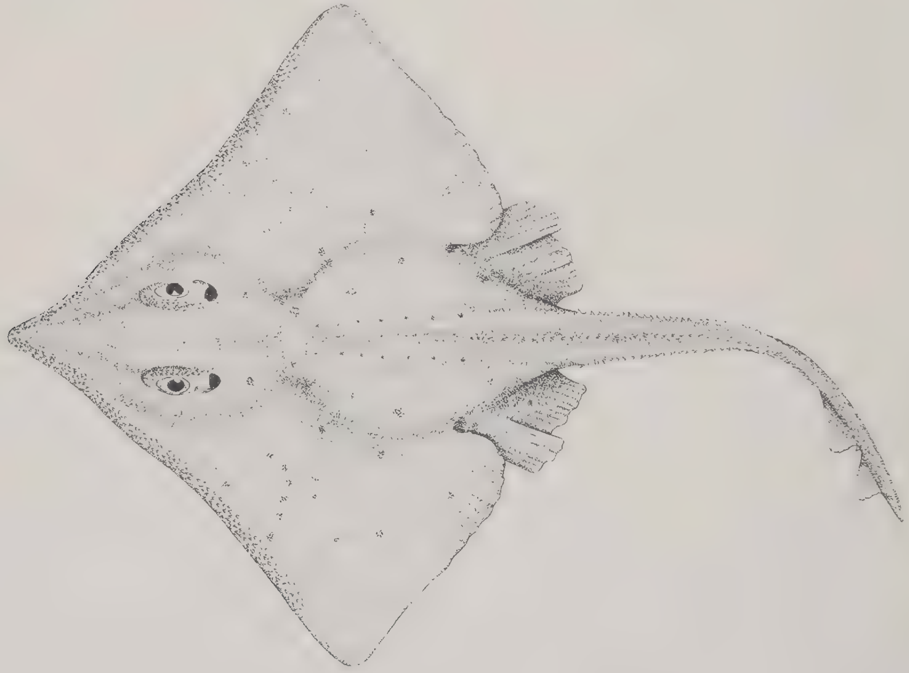
Raja laevis Mitchill 1817

DESCRIPTION: Body depressed, tail slender; disc diamond-shaped, about 1.4 times as broad as long, anterior angle of snout less than 90°, front edge of disc from tip of snout to outer angle slightly concave with a weak convexity opposite eyes, posterior corner of disc broadly rounded. Lateral folds along tail, distance from middle of cloaca to tip of tail about $\frac{3}{4}$ the length from tip of snout to cloaca. Thorns along midline of back comparatively small; tail with median row of thorns from opposite axils of pectoral fins to base of first dorsal, with one or 2 rows of large sharp spines along each side; small thorns on snout and along front edges of pectoral fins; a few spines in front of and behind eyes; males have a patch of erectile hooks on outer side of each pectoral; under side with prickly area along margin of snout, in females this area extends to nostrils. Spiracles just behind eyes on upper side of disc. Mouth ventral, teeth in 30–40 series in upper jaw and 28–38 series in lower jaw; teeth of males are pointed while those of females are flat and without points. Fins: dorsals (2), about equal in size, a short space between their bases, located near end of tail; caudal small, extending from rear of base of second dorsal; pelvics relatively small, deeply concave between anterior and posterior lobes. Claspers of mature males large, extending about $\frac{3}{4}$ of distance from axils of pelvics to first dorsal.

Colour of upper surface brownish with scattered darker spots in varying numbers; usually a dark blotch on inner portion of each pectoral; lower surface white, irregularly blotched with gray. Mucous pores on under side marked with black dots.

DISTINCTIONS: The barndoor skate may be recognized by its very pointed snout and relatively smooth skin, the area from the spiracles to the axils of the pectorals lacking large thorns. It can be distinguished from *R. mollis* and *R. spinicauda,* which also have smooth pectoral areas, by the presence of several rows of spines on the tail. Size is distinctive for the larger ones. The barndoor skate is the only species in the northwestern Atlantic with pigmented mucous pores on the under side.

SIZE: Up to a length of 5 feet.



RANGE: The barndoor skate occurs on the Atlantic coast of North America from the Grand Bank and southern Gulf of St. Lawrence to North Carolina.

Canadian distribution: This species has been reported from the southern edge of both Grand Bank and Green Bank;[17, 18] from Cheticamp, N.S., and the Magdalen Islands and Shallows;[19, 95] very common at Tignish, P.E.I.;[92] frequent at Canso, N.S.,[91] and along the Nova Scotia coast;[513] all parts of the Bay of Fundy and St. Mary Bay;[205] offshore at Banquereau,[18, 19] and Sable Island Bank.[501]

BIOLOGY AND ECONOMICS: The barndoor skate is found on all kinds of bottom from shoal water to depths of 100 fathoms. It tolerates a wide temperature range (32–68 F).

Fertilization is internal and the eggs are laid, probably in winter, in large, yellowish egg cases that are about 5 inches long and 2¾ inches wide. A very short horn, less than 1 inch long, projects from each corner of the case. Females containing fully developed eggs have been found in December and January on Sable Island Bank and in Kennebecasis Bay.[501]

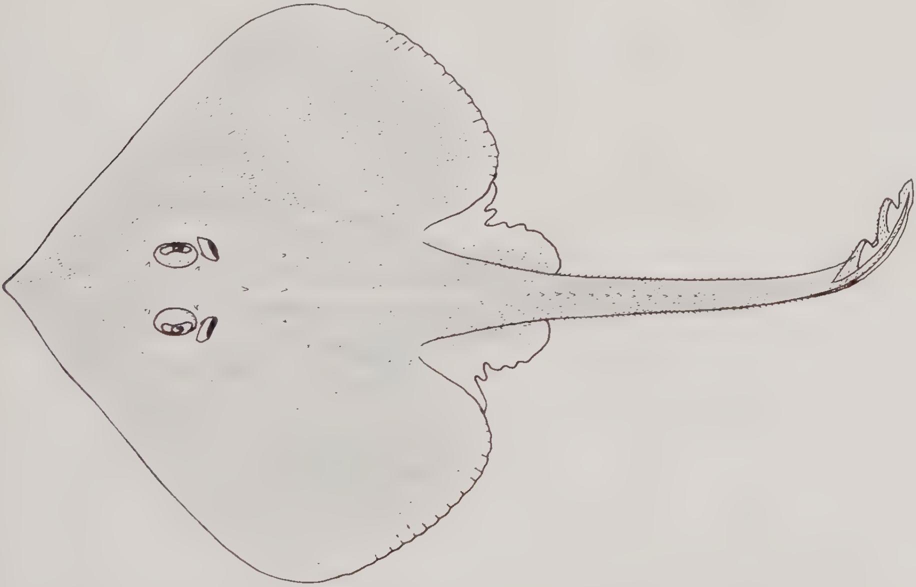
The food of the barndoor skate consists of bivalve molluscs, squid, rock crabs, lobsters, shrimp, worms, and a long list of fishes including spiny dogfish, alewives, herring, butterfish, sand lance, cunner, hake, silver hake, and flatfish.

Little use is made of the small quantities that are caught. They contribute to fish meal in some cases.

Soft skate — Raie molle

Raja mollis Bigelow and Schroeder 1950

Description: Body depressed, tail slender; disc about 1.2 times as broad as long, angle in front of spiracles about 115°; tip of snout pointed; front edge of disc slightly convex, outer and posterior corners of disc broadly rounded. Tail with narrow lateral folds on posterior third; distance from centre of cloaca to tip of tail about 1.1 times length from tip of snout to cloaca. Upper surface rough with small prickles except along posterior margins of disc, one or 2 larger thorns in front of eyes and one near inner edge of spiracle, 2 spines in midline in shoulder region and a smaller one on either side of the second of these, a median row of small thorns on the tail from the tips of the pelvics for about one-third of distance to first dorsal, outer parts of pelvic fins smooth; lower surface of disc and pelvics smooth, tail covered with prickles, above and below, except at tip. Spiracle close behind eye. Mouth ventral; teeth in 54–60 series in upper jaw, about 54 series in lower; cusps, low, conical. Fins: dorsals (2), about equal in size, bases confluent, near end of tail; caudal small, about three-quarters as long as base of first dorsal; pelvics deeply concave, strongly scalloped around indentation.



DISTINCTIONS: This skate may be identified by its wedge-shaped anterior contour, by its lack of conspicuous spines on the disc behind the shoulders and on the posterior part of the tail. The densely prickled lower surface of the tail (except extreme tip) is also diagnostic.

SIZE: The largest known specimen was 12 inches long.

RANGE: Known only from the continental slope off LaHave and Browns banks.

Canadian distribution: All four known specimens were caught off Nova Scotia in depths ranging from 415 to 858 fathoms. One was taken many years ago at lat 41°53′N, long 65°35′W;[48] the other three were trawled in 1953, one quite near the above location and two at lat 42°40′N, long 63°52′W.[51]

Winter skate **Raie tachetée**

Raja ocellata Mitchill 1815

OTHER COMMON NAMES: big skate, eyed skate

DESCRIPTION: Body depressed, tail slender; disc about 1.2 times as broad as long, snout angle obtuse, 130° or more; anterior margin weakly concave near snout, becoming convex to eye level, then weakly concave to outer angle; posterior edge of pectoral broadly rounded. Tail with narrow lateral folds from posterior axils of pelvics to its end; its length from centre of cloaca to tip equal to or slightly greater than length from snout to cloaca. Distribution of thorns on upper surface varies with sex and their number decreases with age. In adults sharp spines are present on the head, around the eyes, along anterior margins of pectorals, over the shoulders and on sides of tail; the midline of back, behind shoulders, almost always free of spines except in young. Under surface smooth in small specimens, larger ones with prickly area near snout and a narrow prickly band along forward anterior edges of disc. Spiracle close behind eye. Mouth ventral, teeth in 72–110 series in each jaw. Fins: dorsals (2), their bases continuous, equal in size and located near end of tail; caudal membrane short; pelvics with anterior and posterior lobes, overlapped by pectorals. Claspers of mature males extend about half way from axils of pelvics to tip of tail.

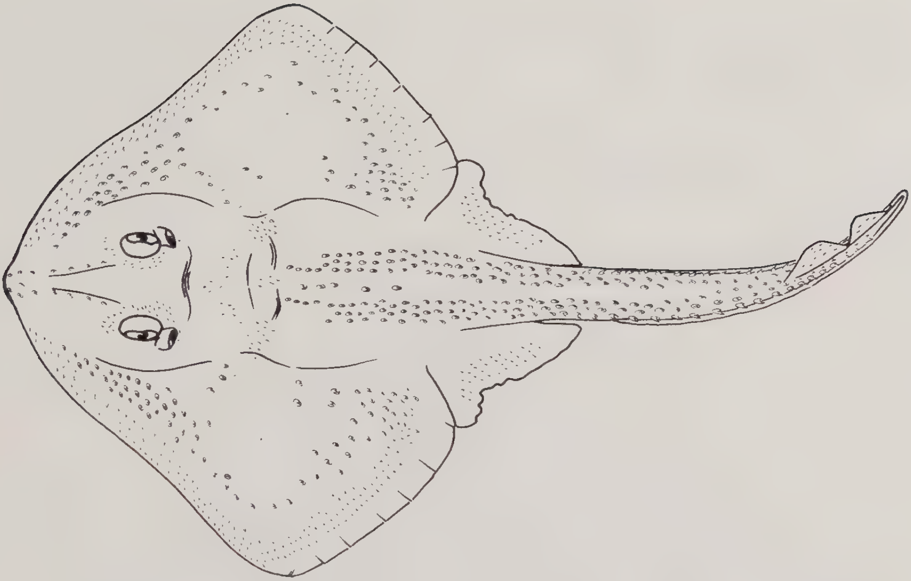
Colour light-brown above with a varying number of rounded, blackish spots; outer or posterior part of each pectoral often with one to four black or dark-brown "eye" spots, edged with white; these eye spots may be lacking. Lower surface usually white but sometimes with pale brown blotches on posterior parts.

DISTINCTIONS: When present the "eye" spots distinguish this skate. If they are absent, the larger number of series of teeth is sufficient to separate it from *R. erinacea*. Specimens over 2 feet long are certain to be this species, if the snout has a very obtuse angle.

SIZE: Up to 43 inches in length.

RANGE: The big skate occurs off the Atlantic coast of North America from the Grand Bank and southern Gulf of St. Lawrence to North Carolina.

Canadian distribution: Inshore this species occurs in the southern Gulf of St. Lawrence at the Magdalen Islands and Cheticamp, N.S.;[18, 95] at Tignish and Malpeque, P.E.I.;[92, 334] at Canso, N.S.;[91] the outer coast of Nova Scotia;[110a, 51] and in the Bay of Fundy and St. Mary Bay.[205] Offshore it has been reported over wide areas of Grand Bank, on Green Bank, St. Pierre Bank, and Banquereau,[17, 18, 20] and on Sable Island Bank.[50]



Biology and Economics: This skate is similar in habits, reproduction, and food to the little skate. Winter skate caught at Canso, N.S., were found to have eaten dollarfish, cunner, and squid. Not used except for the manufacture of fish meal.

Thorny skate **Raie épineuse**

Raja radiata Donovan 1807

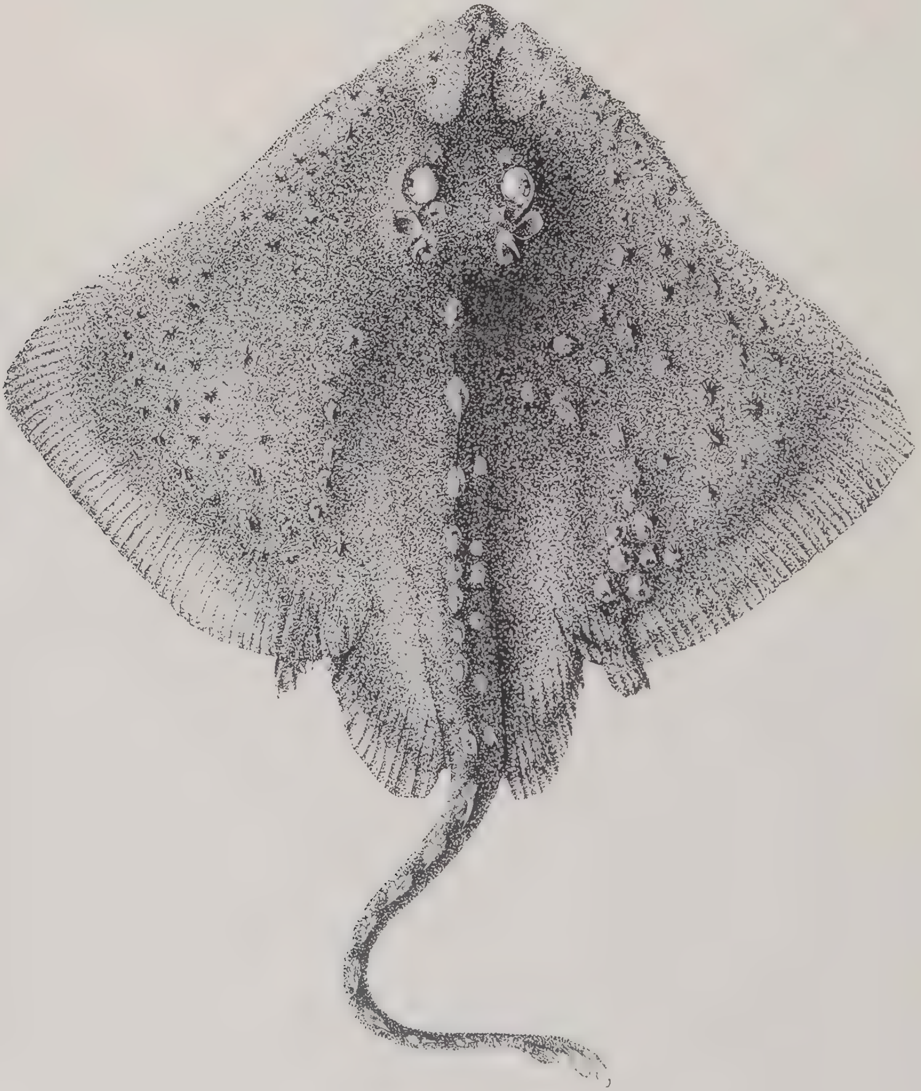
Other common names: starry skate, Atlantic prickly skate

Description: Body depressed, tail slender; disc about 1.4 times as broad as long, snout angle in front of eyes 110–140° depending on size, smaller specimens with greater angle; anterior margin of disc weakly convex when young, except for a weak concavity near snout, sinuous when older; posterior corner of disc more broadly rounded than outer corner. Tail with lateral folds beginning close behind axils of pelvics; length from centre of cloaca to tip of tail about same as from tip of snout to cloaca in adults. Upper surface with a row of large and conspicuous thorns in the midline and extending to first dorsal fin, not over 19 in number; two or three large thorns on each shoulder; one thorn in front of each eye and one behind each; one close to inner end of each spiracle; some smaller thorns scattered on the snout, pectoral fins and tail; the bases of the thorns on the pectorals are star-shaped; adult males with two rows of hooked, erectile thorns on outer corners of pectorals; some prickles on under side between snout and mouth in mature specimens. Spiracle close behind eye. Mouth ventral, teeth in 36–46 series in each jaw, cusps low in females, a little sharper in males. Fins: dorsals (2), similar in size and shape, their bases either separate or running together; caudal membrane short; pelvic lobes separated by deep, scalloped indentation and overlapped by pectorals. Claspers of mature males conspicuously large extending about four-fifths of distance from axils of pelvics to first dorsal.

Colour of upper surface brown, sometimes with darker spots; some specimens have white spots near each eye and on each side of pectorals; under surface white or slightly sooty.

DISTINCTIONS: The thorny skate can be distinguished by the very large thorns on the midline of the back and the presence of less than 10 of these on the tail behind the axils of the pelvics.

SIZE: Up to 40 inches in length.



RANGE: The thorny skate occurs on both sides of the North Atlantic Ocean. On the western side its range extends from West Greenland and Hudson Bay to off South Carolina; on the eastern side from the White Sea and Barents Sea to the western Baltic.

Canadian distribution: North of Great Whale River in southeastern Hudson Bay;[496] Domino Harbour and Lake Melville, Labrador coast;[23] Raleigh, Nfld.;[209] off Cape Bonavista, Nfld;[5] St. Mary's Bay, Nfld.;[19] Trois Pistoles region, P.Q.;[357, 501] taken by research boat *J. J. Cowie* at Escoumain, P.Q., in 1953; Malpeque Bay, P.E.I.;[331] Magdalen Islands and Cheticamp, N.S.;[17, 19, 95] Canso, N.S.;[91] St. Mary Bay, N.S.;[205] Bay of Fundy;[93, 205] eastern and southern Grand Bank;[17, 18, 19] Banquereau and Middle Ground;[17, 19] Sambro and Sable Island banks.[501]

BIOLOGY AND ECONOMICS: The thorny skate is not found inshore. It is taken only in depths of about 10 fathoms or more and has been trawled from over 300 fathoms. It is found on both hard and soft bottom.

It breeds throughout its range and during most of the year. The egg cases are rather large (3 by 2¼ inches) with horns at each corner and with a mass of fibrils lining each long side.[501]

Food of the thorny skate includes shrimp, spider crabs, sea anemones, and small fishes. Although one of the most abundant skates and sometimes caught in moderate numbers in trawls, it has no commercial value except in the manufacture of fish meal.

Smooth skate Raie lisse

Raja senta Garman 1885

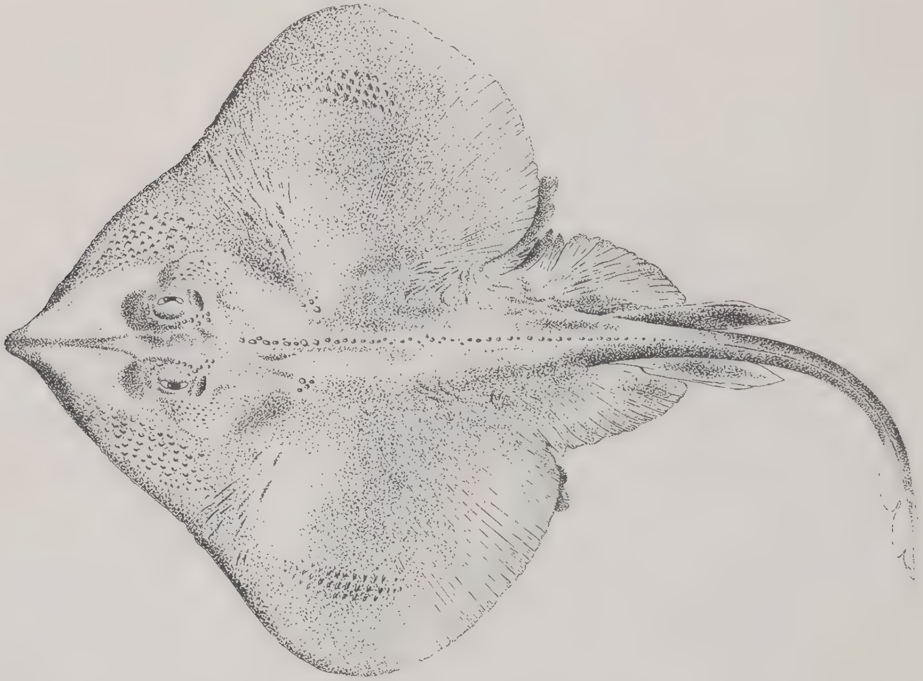
OTHER COMMON NAMES: smooth-tailed skate, prickly skate

DESCRIPTION: Body depressed, tail slender; disc about 1.2 times as broad as long, anterior angle in front of spiracles about 110°; front margins of disc from snout to outer angle almost straight in females, but slightly sinuous and bulging opposite eyes in males; outer and posterior corners of disc well rounded. Tail with inconspicuous, narrow lateral folds on posterior two-thirds; distance from centre of cloaca to tip of tail slightly greater than distance from tip of snout to cloaca. Upper surface of immature specimens closely and uniformly roughened with small prickles over disc as a whole, and on pelvics and tail; older specimens with irregular smooth areas on shoulders and upper pelvics, 16 or more medium to large thorns along the midline of the back, beginning a short distance behind the spiracles, and 20-30 in the midline on front half of tail, 10–15 around inner edge of each eye and 3–5 on each shoulder, males with several rows of recurved spines on outer margin of pectorals; under side of disc smooth except for a few prickles near snout on mature specimens. Spiracle close behind eye. Mouth ventral, teeth in 38–40 series in upper jaw and 36–38 series in lower jaw, cusps low in females, sharper in males. Fins: dorsals (2), their bases joined, similar in size and shape, located near end of tail; caudal membrane about half length of second dorsal; pelvics with narrow anterior lobe separated from posterior lobe by deep and scalloped indentation, overlapped by pectorals. Claspers of mature males reach slightly more than half the distance from axils of pelvics to first dorsal.

Colour of upper surface pale-brown with numerous, obscure, darker spots, sometimes with irregular pale markings; under side white, sometimes with dusky blotches. Young have light patches on tail about level of posterior margins of pelvic fins.

DISTINCTIONS: All but the smallest specimens of the smooth skate can be distinguished by the absence of spines on the posterior one-third to one-half of the tail, and by the gradual dwindling in size of those on the anterior part of the tail becoming indistinguishable from the prickles that cover the upper part of the tail. Small specimens can be identified by a pale crossbar on the tail.

SIZE: Up to a length of 2 feet.



RANGE: The smooth skate occurs in the western Atlantic from the Newfoundland Banks and Gulf of St. Lawrence to off South Carolina, usually in depths of 40 fathoms or more.

Canadian distribution: This species of skate has been caught frequently in the "river" part of the St. Lawrence estuary at Escoumain, Manicouagan, and nearby points in Quebec;[357, 501, 503] and from the north shore of the Gulf of St. Lawrence on Natashquan Bank.[405] It was taken once on the southwestern part of Grand Bank;[10] it occurs on the deeper slopes of Emerald and LaHave Banks[513] and on the southeast slope of Browns Bank.[50] In the Bay of Fundy it has been reported from 10 miles north of Digby Gut (by Stevenson, reported by Vladykov);[501] another specimen was caught there in July 1951.

BIOLOGY AND ECONOMICS: The smooth skate is confined to deep water. It has not been found in less than 25 fathoms and some have been caught in almost 500 fathoms of water. Little is known of its life history. Egg capsules which have been found measure about 2 by 1½ inches, with horns about 2 inches long projecting from each corner.

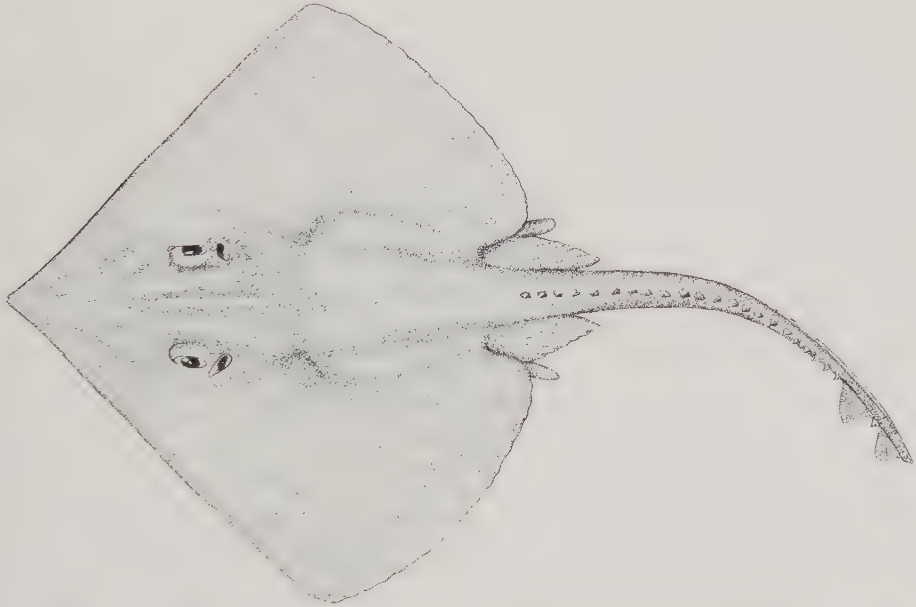
This skate is caught too sparingly to have any commercial importance.

Spinytail skate **Raie à queue épineuse**

Raja spinicauda Jensen 1914

Description: Body depressed, tail slender; disc about 1.2 times as broad as long; angle in front of spiracles 95° or less; front edge of disc slightly sinuous, outer and posterior corners broadly rounded. Tail with narrow lateral folds extending almost its entire length; length from centre of cloaca to tip less than length from tip of snout to cloaca. Much of upper surface of disc rough with prickles, but without thorns; tail with a median row of 21–26 large and conspicuous thorns from a little before the axils of the pelvics to first dorsal fin, one large thorn between dorsal fins; mature males with 3–4 rows of spines on outer part of pectorals. Lower surface of disc smooth. Spiracle close behind eye. Mouth ventral, teeth in 30–34 series in upper jaw and 25–33 series in lower jaw, with sharp, thorn-like cusps. Fins: dorsals (2), about equal in size, bases separate, edges ragged, located far back on tail; caudal short; pelvics two-lobed. Claspers of mature males, small.

Colour of upper surface uniformly pale-brown or gray, paler around posterior edges of pectorals; lower surface of disc white with sooty blotches around edges of pectorals.



Distinctions: This skate is distinguished by the presence of large thorns only on the midline of the tail, commencing slightly in front of axils of pelvic fins. It can be distinguished from the barndoor skate, which it most closely resembles, by its single row of thorns on the tail. The mucous pores on the lower surface lack black pigment.

SIZE: Up to a length of 5 feet.

RANGE: The spinytail skate frequents the waters of the North Atlantic Ocean. In the western Atlantic it occurs on the Greenland side of Davis Strait and off the east coast of Newfoundland to off Georges Bank. In the eastern Atlantic it is found at Iceland and in the Barents Sea.

Canadian distribution: Off Cape Bonavista, Nfld., at lat 48°47′N, long 52°47′W in 91–127 fathoms;[5] Hermitage Bay, Nfld., in 90–140 fathoms;[50] and, if egg case identifications are correct, on the southern slope of Banquereau at lat 44°15′N, long 58°03′W.[50]

BIOLOGY AND ECONOMICS: This skate is an inhabitant of deep, cold water. It has been caught only where water temperatures were between 35 and 37 F. Capelin and starry skate have been found in the stomachs of Greenland specimens.[50]

Family DASYATIDAE (or TRYGONIDAE) Stingrays

This is a large family, primarily of warm seas, some species frequenting the fresh waters of rivers. The bodies of the stingrays are wide and usually less angular than those of skates. Some tropical species have a body twice as wide as long. Stingrays are characterized by the possession of a strong serrated spine or spines near the base of the tail. Special cells, secreting a poison, are located at the base of the spine, and the cells extend along a groove on the trailing edge of the spine. If the spine is driven into the flesh of another creature, the poison is carried in also. Stingray wounds are unusually painful and may at times prove fatal. Ovoviviparous, the young are born alive.

Only one species of stingray has been reported to occur in Canadian waters.

Roughtail stingray **Pastenague à queue épineuse**

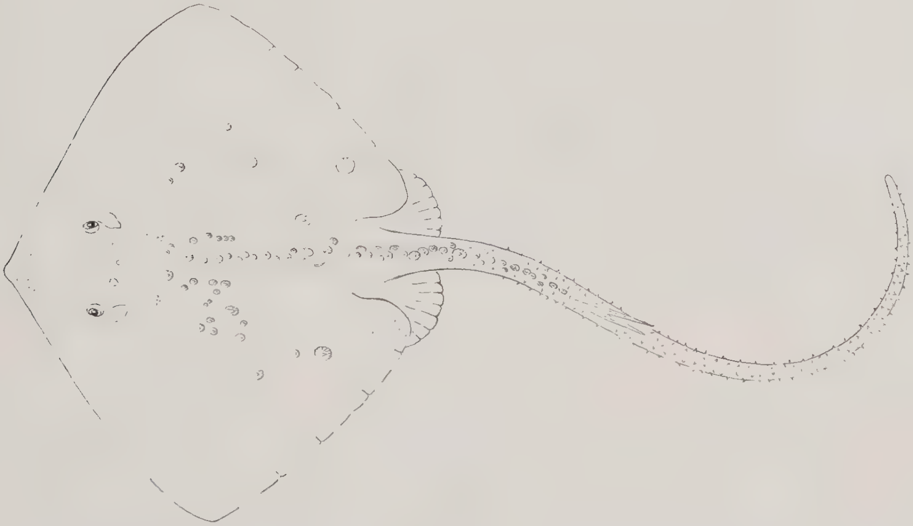
Dasyatis centroura (Mitchill) 1815

DESCRIPTION: Body much depressed, and not separated distinctly from pectoral and pelvic fins; 1.2–1.3 times as broad as length to tip of pelvics; snout angle very obtuse (130–140°); anterior margin of pectorals nearly straight but broadly rounded towards outer corner. Tail very slender and whip-like, with narrow fold of skin on under side from below origin of tail spine and extending rearward about one-fifth length of tail; length from centre of vent to tip of tail 2½ times length from snout to vent; 1, 2, or rarely 3, spear-like spines with serrated edges on upper side of tail, about twice their own length behind pelvics, maximum length of spines about two-thirds distance between eyes. Upper surface of larger specimens with one to 3 irregular rows of conical tubercles along midline of body and one to 20 tubercles dispersed irregularly on the central one-third of the body and pectorals; conspicuous thorns along the whole length of the tail on its upper side and on the lower side from the region of the tail spines. Lower side of body and fins smooth. Spiracles large, behind eyes. Mouth ventral, teeth small, in many series. Fins: dorsals, caudal and anal lacking; pelvic fins with convex outer margins, overlapped by pectorals.

Colour, dark-brown above, tail black rearward from the spines; under surface white.

DISTINCTIONS: The stingray may be recognized by its very long whip-like tail with spear-like spines and the lack of dorsal and caudal fins.

SIZE: Up to slightly over 10 feet in length.



RANGE: Coastal waters from Cape Cod to Cape Hatteras, rarely straying northward; known from Georges Bank.

Canadian distribution: A specimen, 3 feet in total length, closely resembling this species, was reported from Upper Cape, N.B., in Northumberland Strait in September 1953. While it seems probable that a stingray was caught there, some doubt of the identification must persist.

BIOLOGY AND ECONOMICS: The roughtail stingray feeds on annelid worms, Crustacea, and molluscs. The young are born alive and resemble the adults when born.

The tail spines are capable of inflicting painful wounds.

Family MOBULIDAE — Mantas or devilfishes

The mantas constitute a small family of very large fishes occurring most frequently in warm seas. The body is very wide, wider than long, usually with well-developed pointed pectoral fins; tail distinct, slender and whip-like, with a single dorsal fin at its base. The most distinctive feature, in addition to the large size, is the development of fins on the head, called cephalic fins, which project forward, horn-like, from each side of the head. These fins are apparently useful in directing plankton-laden water into the mouth. The fine food particles are strained out of the water by the gills. All are plankton feeders.

The mantas are the largest of the rays and may exceed a ton in weight and a body width of 20 feet or more. They are ovoviviparous, bearing living young.

Only one species strays into Canadian waters.

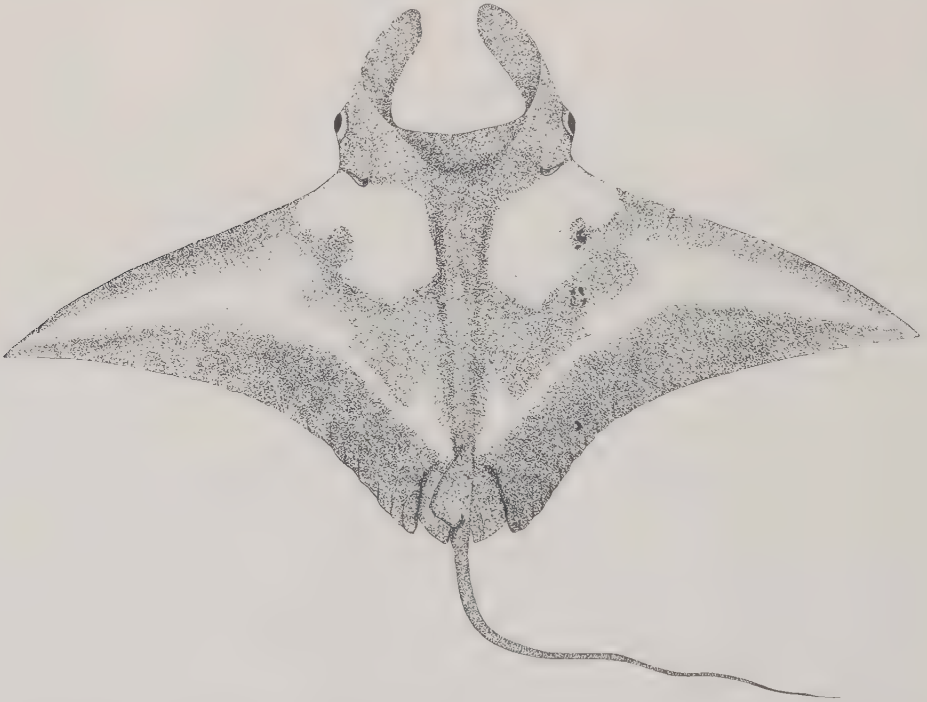
Atlantic manta **Mante atlantique**

Manta birostris (Walbaum) 1792

OTHER COMMON NAMES: devilfish, devil ray

DISTINCTIONS: The manta differs from other rays in that it has two very prominent projections on the head, called cephalic fins. Also, the eyes are large and are located anteriorly on the margin of the disc. The tail is small and whip-like.

SIZE: The manta commonly grows to 16–18 feet in width.



RANGE: The Atlantic manta ranges throughout the warm parts of the North and South Atlantic. Closely related, if not identical, forms occur in the waters of the world's warmer oceans, particularly the Pacific and Indian oceans.

Canadian distribution: This species has not previously been recorded to occur in Canadian waters but in 1962 a 400-pound specimen, measuring 10 feet across, was caught by swordfish fishermen in the northern part of Georges Bank, about 250 miles from Halifax. Bigelow and Schroeder[50] have reported a sight record from southeast Georges Bank and indicate that the nearest record south and westward was a 1686-pound, 19 feet wide, specimen harpooned by a swordfish fisherman off Block Island in August 1921. The 400-pound specimen would seem to be the northernmost record for the West Atlantic. The head of this specimen is in the collection of the Royal Ontario Museum (cat. no. 22146).

Family TORPEDINIDAE — Electric rays

The electric rays are a rather widely distributed group occurring principally in warm seas. The body is generally somewhat thick and disc-like, the skin smooth, soft, and without scales; tail short, stout, usually with a distinct caudal fin; dorsal fins 2, one or none, on the dorsal surface of the stout tail. One large electric organ, formed of many hexagonal tubes, is located on the body between each pectoral base and the head. Some species are said to be able to deliver a shock of about 100 volts but most discharges are of lower voltage. Ovoviviparous, the young are born alive.

Only one species strays into Canadian waters.

Atlantic torpedo — Torpille noire

Torpedo nobiliana Bonaparte 1835

OTHER COMMON NAMES: electric ray, numbfish

DESCRIPTION: Body depressed, tail stout; disc about 1.2 times as broad as long; margins evenly rounded, snout blunt. Tail length from centre of cloaca to tip about two-thirds of length from snout to cloaca. Skin completely smooth on upper and lower surfaces. Eyes small; spiracle close behind each eye. Mouth ventral, moderately arched; number of series of teeth increases with size, from 38 series in each jaw in specimens 25 inches long, to 66 series in upper jaw and 61 series in lower jaw at 40 inches in length; cusps sharp. Fins: dorsals (2), first about as high as long, with rounded corners, its origin slightly in front of axils of pelvics, second dorsal about half as large as first, space between the dorsals about three-quarters the base length of the first dorsal; caudal of equilateral triangle shape with rounded corners, moderately large; pelvics with broadly convex outer margins.

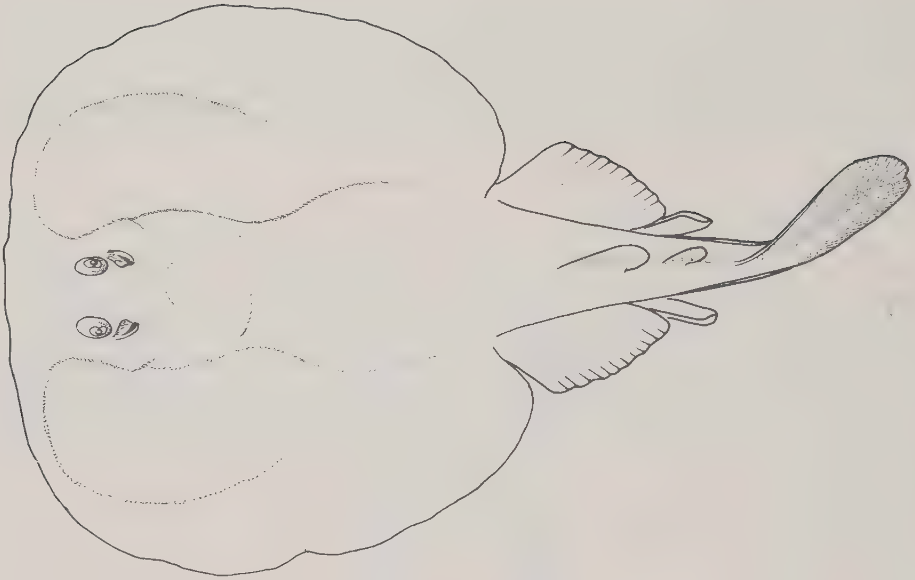
Colour, dark chocolate-brown or nearly black above, uniform or slightly spotted; under surface white, edged with light-brown.

DISTINCTIONS: The Atlantic torpedo can be distinguished from other rays by its smooth skin, truncated snout, and well-developed dorsal fins.

SIZE: Occasionally reaches a length of 71 inches.

RANGE: Both sides of the North Atlantic Ocean. In the west the Atlantic torpedo ranges from southern Nova Scotia to North Carolina; in the east from northern Scotland to tropical West Africa, including the Mediterranean.

Canadian distribution: Occurs only as a stray from the south, having been reported from LaHave Bank in 1890;[50] from Fox Point, St. Margaret Bay, N.S., about 1915;[513] from the lower Bay of Fundy at Eastport, Maine,[50] just on the Canadian border.



Biology and Economics: The most notable fact concerning this ray is its ability to render an electric shock of some intensity to anything touching it; the electric organs are situated in the front-lateral portion of the disc, opposite the eyes and mouth.

The torpedo resembles the sharks rather than the skates in its mode of reproduction. The young are born alive at a length of about 10 inches.

Active fishes, such as salmon, eels, and flounders, have been found in the stomach of the torpedo. It is probable that it stuns its prey with an electric shock. The mouth is very distensible, enabling it to swallow whole quite large fishes.

Subclass HOLOCEPHALI—Chimaeras

This subclass of strange selachians is relatively small and contains only about 24 species classified in four or five genera, grouped into one to three families and one order, called the Chimaeriformes or Chimaerae. Only one family, Chimaeridae, is considered here.

The chimaeras differ from the sharks and rays in that they have fewer teeth, these being united to form plates, two in the upper jaw and one in the lower jaw; the upper jaw is attached to the skull; there is no spiracle; only one gill opening is present on each side behind the head, the gills having a fleshy flap-like covering; the skin is smooth and without scales and there is no cloaca, the anal and urinogenital ducts having separate openings to the exterior.

Family CHIMAERIDAE — Chimaeras, ratfishes, ghost sharks

The chimaeras are found in the deeper or cooler waters of almost all seas. Some authors have further divided this family into two or even three families (Rhinochimaeridae and Callorhinchidae).

Few animal forms present such a weird and striking appearance as do the members of this family. Chimaeras have elongate bodies and a protruding snout which at times may be produced into a lance-like rostrum extending well in front of the head; mouth always inferior with fleshy lips, the incisor-like teeth often easily visible; a strong spine at origin of dorsal fin; large wing-like pectoral fins; males with pelvic claspers. The skin of adults is smooth or naked and without scales; lateral line either an open groove, or a closed groove with pores to outside. All are oviparous and deposit eggs enclosed in elongate or spindle-shaped horny capsules.

Three species have been reported to occur in Canadian waters.

KEY to Family CHIMAERIDAE

1 Snout short and rounded; claspers of males bifid (forked) or trifid .... Deepwater chimaera, *Hydrolagus affinis* (p. 69)

Snout long and pointed; claspers of males simple and rod-like 2

2 Dental plates with knobs and ridges on surface; no denticles on upper margin of caudal fin .... Longnose chimaera, *Harriotta raleighana* (p. 70)

Dental plates smooth or nearly so; a series of rounded knobs or denticles on upper margin of caudal fin .... Knifenose chimaera, *Rhinochimaera atlantica* (p. 71)

Deepwater chimaera — **Chimère de profondeur**

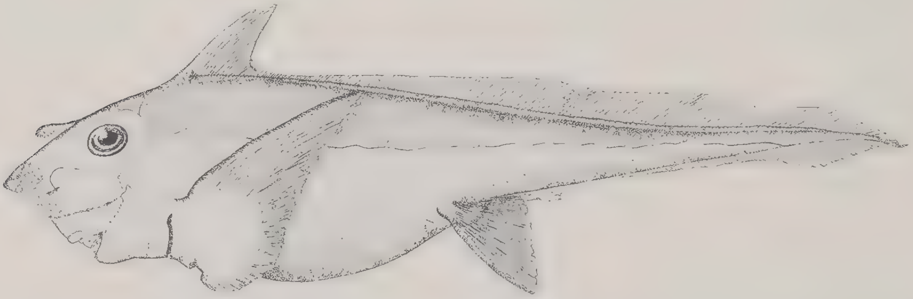
Hydrolagus affinis (Capello) 1868

Description: Body elongate, stoutish anteriorly, compressed behind head and tapering gradually to a point posteriorly. Head short, slightly compressed, dorsal profile oblique, snout conical and blunt; forehead of male bears a cartilaginous hook with recurved prickles on lower surface, believed to act as a clasper. Mouth on under surface of head, small, with fleshy lips; upper jaw with 4 flat plates, outer pair set edgewise, lower jaw with pair of marginal plates, set edgewise, giving appearance of incisors. Eye large, oval, well above and slightly posterior to mouth. A single, short, vertical gill opening on either side, anterior to base of pectoral fin; a flap of skin covers the gills. Skin smooth, scaleless. Fins: dorsals (2), first triangular, about as high as long, base equal to distance between snout and posterior margin of eye, its origin above the gill opening, anterior margin supported by a strong spine, whose terminal portion is free and serrated, second dorsal long and low, beginning a short distance behind the first dorsal and extending almost to the small caudal from which it is separated by a deep notch; caudal, small, lanceolate, symmetrical, ending in a short filament, it extends forward a short distance ventrally on the trunk; no separate anal fin; pelvics abdominal, tip pointed; pectorals larger than pelvics, pointed tips almost reaching origin of pelvics. Males have a blade-like clasping organ in front of each pelvic, lying in a pocket, a longer clasper behind each pelvic fin. Vent between origins of pelvics. Lateral line prominent, branching to various parts of head, associated with mucous pores.

Colour, tawny-brown above and below, distal half of fins leaden, and snout grayish.

DISTINCTIONS: The chimaera can be readily distinguished by its curious overall appearance. The lack of spiracles and the single gill opening on either side separate it from the sharks, skates, and rays. Its skeleton is cartilaginous, separating it from the bony fishes.

SIZE: The largest specimen recorded was 49 inches long.[135]



RANGE: Both sides of the North Atlantic in moderately deep water. On the western side the deepwater chimaera ranges from off the southeastern Grand Bank and Banquereau, along the continental slope to off Cape Cod (lat 39°47′N, long 70°31′W); in the eastern Atlantic, off the coast of Portugal.

Canadian distribution: This species was reported from the southeastern part of the Grand Bank.[34] Many specimens were caught, previous to 1895, by fishermen longlining for halibut along the offshore slopes of Banquereau and LaHave Banks, off Nova Scotia, in about 300 fathoms. With the decline of that fishery they are seldom caught. The most recent record is from 85 miles S × W from Cape Sable, N.S., in October 1930, when the large specimen referred to above was caught in over 400 fathoms.[50, 135]

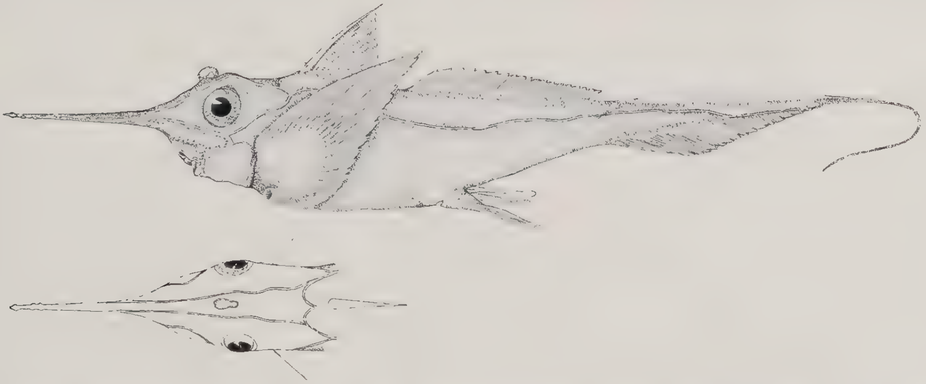
BIOLOGY AND ECONOMICS: A deep-water species, about which little is known. The females deposit eggs that are enclosed in large, brown, horny, tadpole-shaped capsules. In a related species these capsules are 5 inches long.[82]

Longnose chimaera **Chimère-spatule**

Harriotta raleighana Goode and Bean 1895

The longnose chimaera and the following species *Rhinochimaera atlantica*, are remarkably modified fishes in that they have a rostral (or snout) prolongation of amazing proportions. Although neither species is commonly taken by commercial fishing there is evidence to suggest that this species is not uncommon at depths of 400–600 fathoms.

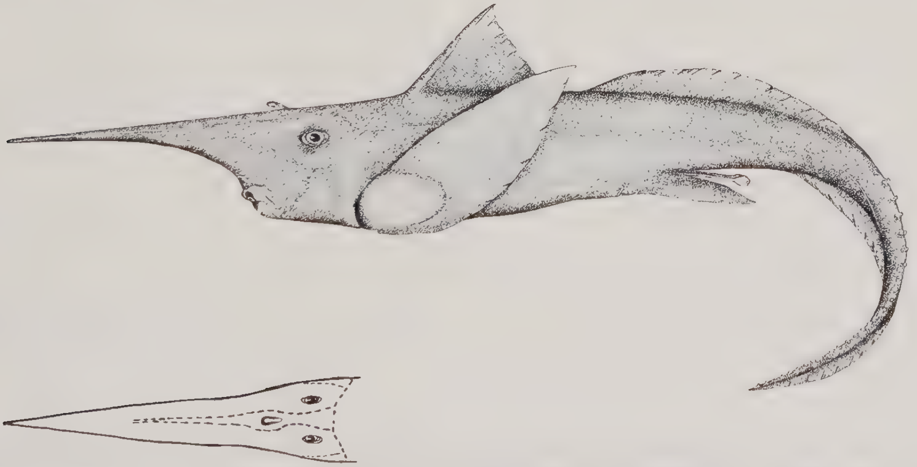
Previous to experimental trawling by the Woods Hole Oceanographic Institution off Nova Scotia and Georges Bank in 1952 and 1953, only five records (off Halifax, southern Nova Scotia, and Georges Bank) were known from this area. However, as a result of this fishing 32 specimens ranging in size from 6 to 36 inches were taken from the waters off Nova Scotia and New England.



Knifenose chimaera **Chimère-couteau**

Rhinochimaera atlantica Holte and Byrne 1909

Until 1952 this species was known to occur only off the Irish Atlantic Slope in the eastern Atlantic. However, in 1952 and 1953, seven specimens were taken off southwestern Nova Scotia and the slope of Georges Bank by experimental fishing carried on by the Woods Hole Oceanographic Institution. These captures were reported by Bigelow and Schroeder,[51] and Schroeder.[414] The specimens, two males and five females ranging in size from 6 to 48 inches, were taken by otter trawl at depth ranges of 290–340 fathoms to 520–545 fathoms. The authors concluded



that this species was more widely distributed in deep waters than was previously supposed.

Class **PISCES (OSTEICHTHYES)**—Bony Fishes

This is the third and largest class of living fishes and includes all those forms popularly thought of as fishes. They differ from the marsipobranchs (lampreys and hagfishes) and selachians (sharks and rays) in many structural details, especially in the possession of an ossified or bony skeleton with: separate vertebrae and a complex skull composed of many bones and plated over with paired frontals and parietals; true jaws, premaxillaries and the maxillaries (toothed bones) forming the upper border of the mouth; usually with overlapping scales; median and paired fins with supporting rays; instead of gill slits, with an operculum composed of four distinct bones covering the gills; and normally with an air bladder that may or may not have a duct to the oesophagus.

The bony fishes are classified in three subclasses (C. T. Regan), or two subclasses depending upon the school of thought—and into about 30 orders, approximately 330 families, and over 3000 genera. Estimates of the number of bony fish species in existence vary from 15,000 to 20,000 or even more. Of this number, occurring throughout the salt and fresh waters of the world, about 260 occur in Canada's Atlantic waters.

KEY to Orders and Families of BONY FISHES

There is a large number of fishes in this category, approximately 20,000 species, varying greatly in size and shape. Compare, for instance, the seahorse and the cod, or a stickleback and a halibut. A key to the identification of the major groups, while it may be difficult to follow at times, will assist in the identification by enabling the reader to determine if the specimen in hand is a member of the smelt family, cod family, mackerel-like fishes, etc. Identification to species can be accomplished by referring to the page following the family or group name.

1 Caudal or tail fin heterocercal (shark-like), i.e. dorsal lobe distinctly larger than ventral lobe; 5 longitudinal rows of bony plates along body; skeleton cartilaginous; mouth inferior, preceded by 4 barbels .... Sturgeons, family Acipenseridae (p. 80)

Caudal fin not obviously heterocercal, but when present is nearly or quite homocercal 2

2 Caudal fin abbreviate-heterocercal, i.e. the scaled peduncle extends more posteriorly above than below but fin nearly symmetrical; body covered with thick rhombic plates; dorsal and anal fins located far back, about equidistant from the snout; jaws long, narrow, and heavily toothed .... Gars, family Lepisosteidae (p. 83)

Caudal fin not abbreviate-heterocercal, nearly or quite homocercal when present;

body with overlapping scales, bony rings or plates, prickles or spines, or naked 3

3 Body strongly compressed laterally and asymmetrical, with both eyes on one side, eyed side uppermost and pigmented; lower side unpigmented or nearly so .... Flatfishes, order Heterosomata (p. 381)

Body shape variable but symmetrical, usually of conventional shape; one eye on each side of head; (dorso-ventral flattening occurs in some pediculate fishes) 4

4 Anterior dorsal fin spine(s) located on head and modified and elongated to form an illicium or movable fishing lure (anglerfishes), or this spine modified to a short stubby projection on snout; pectoral fins usually stalked and limb-like .... Anglerfishes and batfishes, order Pediculati (p. 419)

Anterior dorsal fin spines not modified to form an illicium or fishing lure 5

5 Upper jaw prolonged into a stiff hard process, like a spear; lower jaw pointed but much shorter and not spear-like .... Swordfishes and spearfishes, families Xiphiidae and Istiophoridae (p. 293)

Upper jaw *alone* not prolonged into spear-like process (but both upper and lower jaw may be prolonged) 6

6 Lower jaw prolonged and extended in a spear-like process (its length greater than head length .... Halfbeaks, family Hemiramphidae (p. 168)

Lower jaw *alone* not prolonged and spear-like 7

7 Pelvic fins present (sometimes reduced to a few rudimentary spines) 8

Pelvic fins absent 56

8 Photophores or luminescent organs present; usually small fishes, 12 inches or less in length 9

Photophores absent; small and large fishes 10

9 Body elongate; dorsal fin placed far back very near caudal fin, usually directly over anal fin except in Chauliodontidae and Idiacanthidae; eye small; mouth large and with long, fang-like teeth; often a single, long barbel attached beneath lower jaw; or if body not elongate and without a barbel, then body very deep and mouth nearly vertical (Sternoptychidae), or maxillary long and with edge of maxillary toothed (Gonostomatidae) .... Suborder Stomiatoidea (p. 125)

Body not particulary elongate; dorsal fin about equi-distant from head and caudal fin, its origin distinctly in advance of anal fin; eye large; mouth large but without large, pointed teeth; no barbel beneath head; a fragile adipose fin often present .... Lanternfishes, family Myctophidae (p. 138)

10 Adipose fin present, pelvic fins abdominal in position; all fins with soft rays; scales cycloid when present 11

No adipose fin; pelvic fins jugular, thoracic or abdominal; fins with soft and/or spinous rays 15

11 Rayed dorsal fin absent; adipose fin only on back .... Daggertoothfishes, family Anotopteridae (p. 151)

Rayed dorsal fin present in addition to adipose fin 12

12 Pectoral fin originating on side of body close to operculum, the upper ray greatly prolonged, filamentous, extending to caudal fin (other species of this family may have greatly prolonged first ray of pelvic or lower ray of caudal fin) .... Feelerfishes, family Bathypteroidae*

Pectoral fin inserted near ventral surface and without prolonged rays, upper ray longest and adjoining rays graduated in length 13

13 Dorsal fin about midpoint of body; fins of normal size; body not greatly elongated and not strongly compressed laterally; jaws not beak-like; eye in anterior part of head .... Salmon-like fishes, suborder Salmonoidea (p. 100)

Dorsal fin originating either above pectoral fins or behind centre of body and over pelvic fins; body elongate and compressed laterally; jaws beak-like; eye on or behind centre of head 14

14 Dorsal fin long and sail-like, originating over pectoral fins and extending to above anal fin; teeth well developed .... Lancetfishes, family Alepisauridae (p. 150)

Dorsal fin originating over pelvic fins behind midpoint of body; all fins greatly reduced in size .... Barracudinas, family Paralepididae (Sudidae) (p. 147)

15 An oval-shaped, sucking disc on top of head, the disc with central midrib and lateral branches .... Sharksuckers, family Echeneidae (p. 402)

No sucking disc on top of head 16

16 Pelvic fins abdominal 17

Pelvic fins thoracic or jugular 27

17 Fins soft rayed; scales cycloid when present 18

Fins with one or more stiff spines; scales usually ctenoid when present 25

18 Jaws prolonged (or head elongate as in Fistulariidae), or if not, pectoral and pelvic fins greatly expanded 21

Jaws and head of conventional shape; paired fins not obviously enlarged and wing-like 19

19 Dorsal fin located midpoint of back; scales obvious; pelvic axillary process present; silvery fishes .... Herring-like fishes, suborder Clupeoidea (p. 84)

Dorsal fin located in posterior position on back; no pelvic axillary process . 20

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* At least one member of this family is known to occur in the region.

20 Head scaled; body not strongly compressed laterally; body scaled but no obvious lateral line .... Topminnows, family Cyprinodontidae (p. 172)

Head and body naked or, if scaled, with lateral line; body laterally compressed .... Smoothheads, family Alepocephalidae (p. 99)

21 Gape small, snout greatly extended; small mouth at apex of long snout; a hair-like filament extending from centre of caudal fin .... Cornetfishes, family Fistulariidae (p. 175)

Gape moderate; no hair-like filament extending from caudal fin 22

22 Upper and lower jaws produced and slender 23

Upper and lower jaws not produced conspicuously 24

23 Teeth weak; dorsal and anal fins low or close-cropped, each with 4–8 finlets .... Sauries, family Scomberesocidae (p. 167)

Teeth moderately strong and needle-like in both jaws; dorsal and anal fins higher anteriorally; no finlets .... Needlefishes, family Belonidae

24 Pectoral fins greatly enlarged, the tips extending to or beyond dorsal fin insertion; pelvic fins also enlarged ..... Flyingfishes, family Exocoetidae (p. 169)

Pectoral and pelvic fins of normal size, tips of pectoral fin reaching origin of dorsal fin at most 25

25 No caudal or tail fin; body elongate and tapering to a point; a series of short but well-developed spines on back .... Tapirfishes, order Heteromi (p. 164)

Caudal or tail fin present; body typically fish-like 26

26 Skin naked or with bony plates but no overlapping scales; soft dorsal fin preceded by isolated spines; pelvic fin reduced mainly to a strong spine .... Sticklebacks, family Gasterosteidae (p. 178)

Overlapping scales present; soft dorsal fin preceded by a separate spiny dorsal fin of 4 slender spines; pelvic fin of one spine and 5 soft rays .... Mullets and silversides, suborder Mugiloidea (p. 333)

27 Fins without spines or stiff rays; all rays branched and/or soft rayed; no spines on head 28

Stiff spines* or spine-like branched rays in dorsal, anal, or pelvic fins, and sometimes on head and gill covers (especially scleroparid fishes) 31

28 Dorsal and anal fins long and continuous with caudal fin, no separate caudal fin .... Eelpouts, family Zoarcidae (p. 315)

Dorsal and anal fins distinct from caudal fin, dorsal fin of one, 2 or 3 parts 29

29 Dorsal fins usually 2 or 3 (only *Brosme* has one); anal fins one or 2; often chin barbel present; often with filamentous fin rays; rather heavy-bodied fishes .... Cod-like fishes, order Anacanthini (p. 185)

Dorsal and anal fins single and long; caudal forked; body laterally compressed and colourful 30

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* Sometimes branched (i.e. "soft") rays are very stiff and spine-like as in Macrouridae.

30 Pelvic rays 14–17; body disc-shaped, silvery with red fins; oceanic .... Opahs, family Lamprididae (p. 226)

Pelvic rays 6–7; dorsal fin commencing over head; caudal fin widely forked; body elongate and of many hues .... Dolphins, family Coryphaenidae (p. 256)

31 No true caudal fin, body tapering to a pointed tail; snout distinctly projecting .... Grenadiers, rat-tails, family Macrouridae (p. 219)

A distinct caudal fin present 32

32 A series of dorsal and anal finlets (distinct small fins) behind the 2 median fins 33

No dorsal or anal finlets 34

33 Lateral line well developed; skin smooth; scales small; dorsal spines well developed, high in front and low posteriorly .... Mackerels, family Scombridae (p. 279)

Lateral line faint or absent; scales larger and smooth or with sharp spines; dorsal spines more or less weakly developed, widely spaced, uniformly low .... Snake mackerels, family Gempylidae (p. 275)

34 A series of bony plates with thorn-like points on both sides at base of dorsal and anal fins and along sides or midline of belly; body laterally compressed and disc-shaped .... Dories, order Zeomorphi (p. 231)

No bony plates along dorsal and ventral margins of body 35

35 Pelvic fin with one spine and 6 (5 in *Diretmus*) or more soft rays (if no spine, with 2 long throat barbels); pelvic fin base usually behind pectoral fin base; oceanic forms, rare in this region .... Berycoid fishes, order Berycomorphi (p. 227)

Pelvic fin with one spine and 5 or fewer soft rays; pelvic fin base usually under or in advance of pectoral fin base 36

36 Body completely covered with rows of hard overlapping plates; head large; small, slender fishes under 8 inches long .... Poachers and alligatorfishes, family Agonidae (p. 363)

Body scaled, naked, or with dermal prickles; spiny-rayed fishes of variable shape and size 37

37 Pectoral fins enlarged and wing-like, extending to middle of 2nd dorsal fin or beyond; head with bony armour 38

Pectoral fins more or less normal or of conventional shape or somewhat reduced 39

38 Pectoral fins extending to beyond insertion of 2nd dorsal fin, lower rays longest; gill cover with long, spiny backward extension .... Flying gurnards, family Dactylopteridae (p. 380)

Pectoral fins extending to about middle of 2nd dorsal fin, the lower 3 rays shortest, free of membrane, and somewhat thickened .... Searobins, family Triglidae (p. 340)

39 A single, fleshy adipose fin, atop head and in front of dorsal fin .... Tilefishes, family Branchiostegidae (p. 243)

No fleshy adipose fin atop head 40

40 Body and head entirely naked and smooth, usually uniformly black in colour; caudal fin forked; pelvic fins of normal size, thoracic, of one spine and 5 soft rays .... Black swallowers, family Chiasmodontidae (p. 274)

Body normally scaled or with scattered tubercles or spines on body or head; caudal fin rounded, truncate or forked 41

41 Anal fin rays soft and flexible, not preceded by short, stiff spines; pelvic fin rays usually 3; body tadpole-shaped .... Sculpins, family Cottidae (p. 344)

Anal fin preceded by 2–4 stiff spines, sometimes detached from anal fin; pelvic fin rays usually of one spine and 5 soft rays, sometimes fewer; body not tadpole-shaped 42

42 Pelvic fin reduced, of one spine and one to 3 soft rays; body elongate; body depth into length 6 or more ... Blenny-like fishes, suborder Blennioidea (p. 297)

Pelvic fin of one spine and 5 soft rays; body somewhat laterally compressed, roughly 3 times as long as deep 43

43 Anal fin preceded by one or 2 spines (these sometimes become inconspicuous with age) 44

Anal fin preceded by 3 or 4 spines (these sometimes becoming partly obscured by skin) 48

44 Two prominent chin barbels, red in colour; pelvic axillary scale present .... Surmullets, family Mullidae (p. 261)

No chin barbels 45

45 A single dorsal fin, slender spines combine with fin and are not readily distinguishable; dorsal, anal, and caudal fins falcate; dorsal and anal fins about equal .... Pomfrets, family Bramidae (p. 257)

Soft dorsal fin preceded by a distinct spiny dorsal fin or by a series of 3 or more short spines; with or without scales 46

46 Anal fin spines stout and clearly joined to anal fin by membrane; first dorsal fin spiny and distinct, of 10 or more spines .... Drums, family Sciaenidae (p. 259)

Anal fin spines usually short and joined to or detached from anal fin; first dorsal fin spiny and of 3–8 spines 47

47 Anal fin spines typically short and located in advance of anal fin (16–28 rays); maxillary usually not extending beyond eye posteriorly; caudal peduncle thin and often with lateral keel; pelvic fins well developed .... Jacks and pompanos, family Carangidae (p. 246)

Anal fin spines also in advance of fin but usually concealed in skin; maxillary extending beyond eye; caudal peduncle not thin but stout and without lateral keel; pelvic fins small .... Bluefishes, family Pomatomidae (p. 244)

48 Head spiny, with one to 5 spines on posterior margin of preopercle 49

Head not spiny 50

49 Spiny and soft-rayed portions of dorsal fin confluent; preopercle with 4 or 5 spines; body colour red .... Rockfishes, family Scorpaenidae (p. 337)

Spiny and soft-rayed portions of dorsal fin distinctly separate forming 2 distinct dorsal fins; preopercle with one or 2 spines; body colour dark brown or black .... Cardinalfishes, family Apogonidae (p. 242)

50 Two dorsal fins, the first spiny, the 2nd soft-rayed 51

A single dorsal fin, the spiny and soft rayed portions broadly joined 53

51 Head naked or scales confined to opercle only; dorsal fin spines 8 or less (only Nomeus has 11) .... Butterfishes, family Stromateidae (in part) (p. 329)

Head normally scaled (or, if not, anal fin rays 16–28) 52

52 Anal fin of 3 spines and 9 or 10 soft rays; peduncle without a lateral keel .... Basses, family Serranidae (p. 234)

Anal fin of 2, 3, or 4 spines and 16–30 soft rays, spines sometimes wanting on older specimens; peduncle often with a lateral keel .... Jacks and pompanos, family Carangidae (p. 246)

53 Dorsal fin spines 16–18; caudal peduncle obviously stout; lower incisor teeth prominent .... Wrasses, family Labridae (p. 267)

Dorsal fin spines 10–13; caudal peduncle not obviously stout; lower incisor teeth small 54

54 Dorsal fin spines 10; anal fin with 3 spines and 7 soft rays; no pelvic axillary scale .... Basses, family Serranidae (in part) (p. 234)

Dorsal fin spines 11–13; anal fin with 3 spines and 10–16 soft rays; pelvic axillary scale present 55

55 Body disc-shaped; anal fin with 16 soft rays; a black spot on soft dorsal fin base .... Butterflyfishes, family Chaetodontidae (p. 265)

Body deep but not disc-shaped; anal fin with 10–12 soft rays; no black spot on soft dorsal fin .... Porgies, family Sparidae (p. 262)

56 A well-developed sucking disc on breast, formed from modified pelvic fins ... Lumpfishes and seasnails, family Cyclopteridae (p. 367)
No sucking disc on breast ... 57

57 First dorsal fin of one or 3 well-developed spines; skin hard and scaly or rough like sandpaper; belly often pointed ... 58
First dorsal fin not consisting of one or 3 large spines ... 59

58 First dorsal fin with one large and 2 small spines; body covered with hard, interlocking (often diamond-shaped) scales which form an effective armour; teeth well developed and crowded but not fused ... Triggerfishes, family Balistidae (p. 411)
First dorsal fin consisting of one large spine only; body covered with small denticles, like sandpaper; teeth well developed but fused; belly often produced ventrally to a point ... Filefishes, family Monacanthidae (p. 406)

59 Body covered with bony plates forming a series of bony ridges; mouth small and at end of prolonged snout; fins small; gill openings small; small fishes ... Seahorses and pipefishes, family Syngnathidae (p. 176)
Body not covered with bony plates and ridges ... 60

60 No distinct caudal fin; dorsal and anal fin rays blending with caudal fin rays, or tail ending in sharp point ... 61
Distinct caudal fin present or body terminating abruptly behind the erect dorsal and anal fins ... 63

61 Mouth enormously enlarged, reaching to origin of dorsal fin; eye small and near tip of snout; luminous organs at base of dorsal fin; rare deep-sea forms ... Gulpers, family Eurypharyngidae (p. 152)
Mouth of moderate size, or jaws duck-like or slender and extended bill-like; no luminous organs ... 62

62 Dorsal and anal fin rays soft; body elongate; eyes set in sides of head; mouth not at an acute angle ... True eels, order Apodes (p. 153)
Dorsal and anal fin rays spiny; body elongate and compressed; eyes somewhat elevated; mouth at an acute angle ... Wrymouths (*Cryptacanthodes*), family Stichaeidae (p. 307)

63 Body deep or stout, not elongated; mouth small ... 64
Body elongated; mouth large ... 67

64 Body completely encased in a hard and rigid covering, only caudal peduncle free ... Boxfishes or trunkfishes, family Ostraciontidae (p. 413)
Body not encased in hard covering ... 65

65 Body terminating abruptly behind erect dorsal and anal fins; without rayed caudal fin; skin leathery ... Ocean sunfishes or headfishes, family Molidae (p. 417)
A rayed caudal fin present ... 66

66 Body deep and laterally compressed; 3 embedded spines before anal fin; scales small .... Butterfishes, family Stromateidae (in part) (p. 329)

Body stout, not laterally compressed; without fin spines; without scales but either prickly or body covered with stout spines .... Porcupinefishes and puffers, families Tetraodontidae and Diodontidae (p. 414)

67 Snout bluntly rounded; upper and lower incisors conical and prominent; dorsal and anal fins well developed and obvious .... Wolffishes, family Anarhichadidae (p. 298)

Snout sharply pointed; incisors not obvious 68

68 Fin rays soft, no spines, mouth toothless; a ridge of skin, low on each side along belly; scales small and arranged in oblique rows; small fishes .... Sand lances, family Ammodytidae (p. 271)

Fin rays weakly spiny, at times a strong spine behind anus; usually with obvious teeth; scales absent; deep-sea fishes .... Cutlassfishes or hairtails, family Trichiuridae (p. 277)

Subclass PALAEOPTERYGII

The name of this subclass is derived from the words *palaeo*, meaning old or ancient, and *pterygi*, meaning fins, and refers in part to the archaic nature of this group of bony fishes. They are characterized by having more fin rays in the fins than basal supports for these fin rays. There are two orders of living fishes belonging to this subclass, but only one family, the Acipenseridae, is represented in Canadian Atlantic waters.

Family ACIPENSERIDAE Sturgeons

Sturgeons are regarded as primitive fishes because they possess many features that have been passed on from generation to generation, almost without change for millions of years. Living sturgeons are very similar to fossil sturgeons laid down in Cretaceous rocks 100 or more millions of years ago.

The body of a sturgeon is elongate and there are five longitudinal rows of bony plates; the dorsal lobe of the caudal fin is larger than the lower lobe, i.e. the caudal fin is heterocercal; the head is covered with hard bony plates that, on meeting, form prominent sutures; a spiracle is often present; the jaws are weak and inferior; there is a well-developed snout or rostrum on the ventral surface of which four fleshy barbels are suspended, in front of the mouth. There is a spiral valve in the lower intestine.

Sturgeons occur in Europe, Asia, and North America. Although there are about 25 species known, only two occur in Canada's Atlantic coastal waters.

KEY to Family ACIPENSERIDAE

Rays in anal fin 19–22; dorsal plates or bucklers widely spaced (up to $\frac{1}{2}$ length of a plate); peritoneum blackish; snout short; size smaller (to 36 inches) .... Shortnose sturgeon, *Acipenser brevirostrum* (p. 81)

Rays in anal fin 23–30; dorsal plates or bucklers not widely spaced but crowded; peritoneum pale; snout longer; size large (to 14 feet) .... American Atlantic sturgeon, *Acipenser oxyrhynchus* (p. 82)

Shortnose sturgeon — Esturgeon à museau court

Acipenser brevirostrum LeSueur 1818

Description: Body elongate, somewhat cylindrical, greatest depth $6\frac{3}{4}$ in total length occurring a short distance behind tip of pectoral fin, body tapering gradually to a stout caudal peduncle; 5 rows of bony shields on body. Head and snout depressed, $4\frac{4}{5}$ in total length, covered with bony plates joined by sutures; mouth on under side of head about middle, protractile, toothless; 4 barbels on under side of head between tip of snout and mouth; prominent nostrils in front of eye. Eye small, about 14 in head. Fins: dorsal (1) about 41 rays, first rays highest, less than 3 in head and equalling length of fin base, located just before caudal peduncle; caudal large, upper lobe much the longer, being about equal to length of head; anal 19–22 rays, longest rays $2\frac{1}{2}$ in head, roughly triangular, length of base 5 in head, located under posterior part of dorsal fin; pectorals pointed, $1\frac{3}{5}$ in head length, base low on side just behind gill opening; pelvics smaller, longest rays 3 in head, located ventrally at beginning of posterior third of body. Dorsal row of bony shields consists of 8–11 shields that do not overlap and may have considerable spaces between; 22–33 shields on side of body, occupying midline of side except anteriorly where they are above midline; ventral line of 6–9 small shields low on each side of body; shields only slightly roughened. Skin between dorsal and lateral shields is sparsely set with fine prickles. Viscera blackish.

Colour blackish above, tinged with olive above the lateral shields; sides below lateral shields reddish to violet; belly white.

Distinctions: The snout is much shorter than that of sea sturgeon of equal size (head $4\frac{4}{5}$ in total length in shortnose sturgeon and $3\frac{1}{2}$ in total length in sea sturgeon). The bony plates are smoother and may be more widely spaced and the viscera are black as compared to the pale colouration in the sea sturgeon.

Size: Up to a length of 3 feet.[49]

Range: Found close to shore or in rivers from the Saint John River, N.B., to South Carolina.

Canadian distribution: An early record by Fortin[139] for the St. Lawrence River was shown to be erroneous.[423] However, one specimen, 27 inches long, was caught in the Long Reach, Saint John River in May 1957.[265, 425] Canadian records are only from fresh water. The species is included here on the presumption that it is anadromous.

Biology and Economics: The shortnose sturgeon is known to spawn in the Hudson River in April. They have been caught there in spring, summer, and winter, suggesting little migration. Growth is slow, 5-year-olds measuring from

20 to 26 inches in length and 14-year-olds from 25 to 30 inches.[176] There are records of shortnose sturgeon caught in the sea near Cape Cod, Massachusetts.[49]

American Atlantic sturgeon — Esturgeon noir

Acipenser oxyrhynchus Mitchill 1815

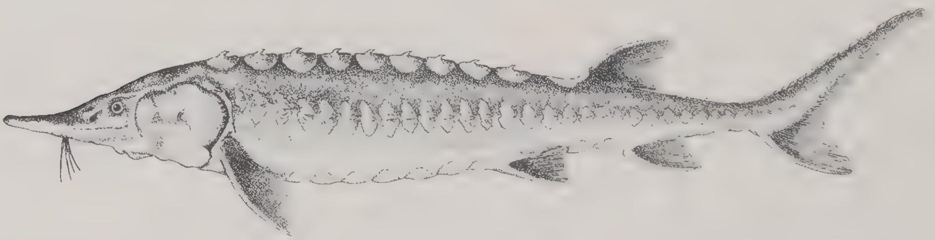
Other common names: sea sturgeon

Description: Body elongate, somewhat cylindrical, armed with 5 rows of bony bucklers, each with a median keel terminating in a spine. Head and snout much depressed, 3½ in length, covered by bony plates joined by sutures. Fins: dorsal (1), 38–46, origin between pelvics and anal, triangular; caudal, heterocercal, upper lobe much prolonged; anal, 26–28, smaller than dorsal; pelvics, small, well to rear on abdomen; pectorals set low, just behind head. Eye, small, about 14 in head. Nostrils large, double, in front of eye. Small spiracle above each eye. Mouth ventral, small, toothless, with protractile lips. Barbels 4, pointed, in transverse row half way between tip of snout and mouth. One external gill opening on each side. Dorsal row of 10–16 bucklers, extending from rear of head to base of dorsal fin, bucklers touching each other or overlapping; 26–34 bucklers in each upper lateral row, extending from behind gill openings to base of tail; 9–14 bucklers in each lower lateral row, extending from close behind pectoral fin to anal fin. Viscera pale.

Colour, olive-green to bluish-gray above, middle of each dorsal and upper lateral buckler whitish; belly white.

Distinctions: The sea sturgeon may be separated from the freshwater species of sturgeon by the presence of at least one paired set of bucklers behind the vent; freshwater species have the post-anal bucklers in a single line. The sea sturgeon has 17–27 gill rakers on the first gill arch; the freshwater species *A. fulvescens* has 27–39.[512]

Size: Up to 14 feet in length and 811 pounds in weight.[509]



Range: From Hamilton Inlet, Labrador, and possibly Ungava Bay, to the Gulf of Mexico.

Canadian distribution: A species of sturgeon, probably *A. oxyrhynchus*, has been reported from the lower George River, which flows into Ungava Bay;[269] Hamilton Inlet, Labrador;[23] the estuary of the St. Lawrence between Three Rivers and Isle Verte, Que.; along the Gaspé coast, Chaleur Bay, and on the North Shore from the Saguenay River to Blanc Sablon;[509] Miramichi estuary;[312]; Cheticamp and Aspy Bay, N.S.;[95] Hermitage Bay, Nfld.;[509] Bay of Fundy, Passamaquoddy Bay, Minas Basin, Saint John, and Avon rivers.[205]

BIOLOGY AND ECONOMICS: The American Atlantic sturgeon is anadromous, entering rivers to spawn. Little is known of its movements in the sea. Of a few sturgeon that were tagged in the St. Lawrence estuary at Kamouraska and Ile aux Coudres, two were recaptured at distant places, one at Hermitage Bay, Nfld., 8 years later, and the other near Halifax, N.S., 1 year later.[509]

Sturgeon leave the sea in spring and spawn in fresh water during May and June. Each female deposits a large number of eggs, a large female producing up to nearly 4 million. The eggs are $^1/_{12}$–$^1/_{10}$ inch in diameter. The hatching period is short, 1–2 weeks, depending on water temperature. The young develop in fresh water where the young sturgeon remain for several years before going to sea.

There is no information on the rate of growth of sturgeon in Canadian fresh waters. Farther south in the Hudson River, sturgeon 23 inches long and weighing 3 pounds, are 5 years old.[176] Some information was obtained on the growth in salt water through tagging in the St. Lawrence estuary. The greatest growth was shown by a 33-inch fish that added 10 inches to its length in 2 years; others about 30 inches long increased by 8 inches in 3 years.[505] Males reach a length of 77 inches and females 88 inches in 12 years.[509]

The sturgeon is a bottom feeder. Small sturgeon in fresh water eat algae, insect larvae, and cladocera, adding amphipods and isopods when larger.[392] When living in the sea they eat molluscs, annelid worms, and some small fish such as sand lance.

The catch of sturgeon from the Canadian Atlantic area for 1962 was 57,000 pounds, with a value of $11,000.[70b] The roe is valued as caviar and the flesh of the larger sturgeon is sometimes smoked.

Subclass NEOPTERYGII

The great majority of the fishes of the world occur in this subclass. In contrast to the Palaeopterygii, each fin ray in the fishes in this subclass has a separate bony supporting element. This condition is regarded as an advance over the first subclass, hence the name Neopterygii from *neo* meaning new, and *pterygi* meaning fin, i.e. the new-finned fishes.

Of the 30 or more orders composing the subclass, at least 19 are represented in Canadian Atlantic waters.

Family LEPISOSTEIDAE — Gars

Longnose gar — Lépisosté osseux

Lepisosteus osseus (Linnaeus) 1758

The longnose gar is not to be regarded as a marine species but it is included here because of the observations of Dr. Yves Jean.[207] He caught two specimens in the St. Lawrence River near Ste. Anne de la Pocatiere, Que., 75 miles downriver from Quebec City, in a locality where the salinity varies from 13 to 20‰, or as high as 25‰, at the bottom. The upper limit of salinity tolerance for the species is not known but those figures are the highest known to us.

Order ISOSPONDYLI (Clupeiformes)

This is the first main order of the bony fishes and economically one of the most important of all orders. Its members are among the most generalized of the true bony fishes and form the basis for the more advanced types. Some of the more important characters of this order are: fins all soft-rayed, i.e. without stiff sharp spines, pelvic fins abdominal in position and with more than five soft rays, tail or caudal fin homocercal; maxillary bones included in the gape and usually forming the border of the upper jaw; air bladder connected to the oesophagus by an open duct; adipose fin often present; scales when present usually cycloid; no electric organs.

Three suborders are represented in our area—the Clupeoidea, Salmonoidea, and Stomiatoidea.

Suborder CLUPEOIDEA—Herring-Like Fishes

The clupeoid fishes embrace a large assemblage of pelagic, herring-like, marine forms. The clupeoids are usually silvery fishes with large deciduous, cycloid scales, no adipose fin and complete oviducts.

The Canadian Atlantic clupeoids are classified in five families, Elopidae (tarpons), Albulidae (bonefishes), Clupeidae (herrings), Engraulidae (anchovies), and Alepocephalidae (smoothheads). Of these, the family Clupeidae is most important, both economically and in the number of species occurring in our area.

KEY to Families of Suborder CLUPEOIDEA

1 A prominent gular plate present between the 2 arms of the lower jaw; last ray of dorsal fin prolonged and filamentous . Tarpons, family Elopidae (p. 85)
No gular plate; last ray of dorsal fin not prolonged 2

2 Mouth inferior and small, not extending beyond eye; lateral line present .... Bonefishes, family Albulidae (p. 85)
Mouth terminal or lower jaw somewhat projecting; lateral line present or absent 3

3 Dorsal fin long, low, located posteriorly; anal fin opposite dorsal fin; lateral line often present .... Smoothheads, family Alepocephalidae (p. 99)
Dorsal fin short, located about mid body; no lateral line 4

4 Mouth terminal and moderate, extending at most to eye or slightly beyond .... Herrings, family Clupeidae (p. 86)
Mouth inferior, snout projecting, mouth (gape) very wide, extending far beyond eye; small fishes .... Anchovies, family Engraulidae (p. 98)

Family ELOPIDAE — Tarpons

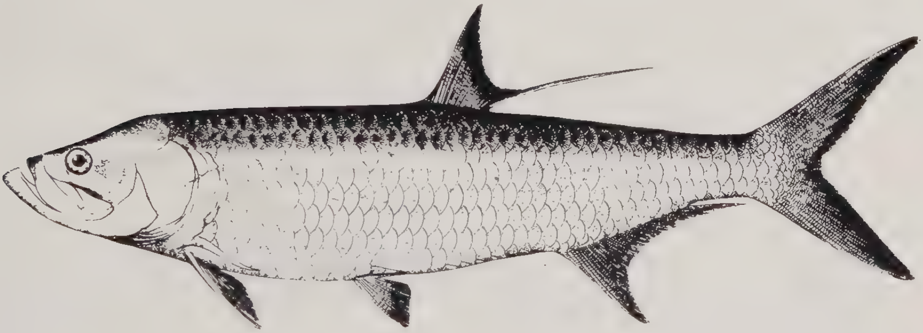
Tarpon — **Tarpon**

Megalops atlanticus Valenciennes 1847

DESCRIPTION: Body oblong, compressed, depth about 4 in length, lower edge with ordinary scales. Mouth large, oblique, lower jaw prominent and projecting, maxillary extending beyond eye. Eye 7 in head. Fins: dorsal (1), 12, short and high, situated well behind pelvics, last ray much prolonged; anal 20, falcate, last ray produced; caudal widely forked. Scales large, thick, silvery, about 42 in lateral line. A bony plate (gular plate) on the throat between the branches of the lower jaw. Sharp teeth on jaws, tongue, and on several mouth bones.

Colour silvery, darker above.

SIZE: Up to a length of 8 feet.



RANGE: Nova Scotia to Brazil but rare north of Cape Cod.

Canadian distribution: The tarpon was reported many years ago off Isaacs Harbour and in Harrigan Cove, N.S. A 3-foot specimen was caught off Terence Bay, N.S., in September 1947, and two were caught in early August 1953, near Sambro Light, N.S. These were 4⅓ and 5½ feet long.[8]

BIOLOGY AND ECONOMICS: Although a prized sportfish in southern waters, the tarpon is at present too scarce in Canadian waters to be of interest to sportsmen.

Family ALBULIDAE — Bonefishes

Bonefish — **Banane de mer**

Albula vulpes (Linnaeus) 1758

Halkett[184] reported a capture of a specimen identified as this species, from Black's Harbour, Charlotte County, N.B., in September 1911. He noted that the specimen was only 7 inches long and in very poor condition, and that ". . . the snout does not overlap the mouth." This record was repeated by Huntsman.[205]

The absence of any records of this species north of Cape Cod in the last 50 years gives cause to doubt the validity of the original identification. Possibly the specimen in question was *Etrumeus sadina.*

Family CLUPEIDAE True herrings

The true herrings comprise a large family of about 200 species which are mainly marine, usually swimming in shoals near the surface frequenting coastal waters and generally feeding on plankton.

The various species are usually laterally compressed, have large deciduous scales, lack a lateral line and the midline of the belly is frequently serrated; the dorsal fin is usually short, caudal fin forked, no adipose fin, oviducts present and teeth small or absent.

As a rule the various species of herring form schools made up of immense numbers of individuals. Seven species have been reported for Canadian waters. One of these seven species, *Alosa mediocris*, was reported only once, in 1852, and it is not treated as a species occurring in Canadian waters.

KEY to Family CLUPEIDAE—Herrings

1 Origin of dorsal fin distinctly anterior to pelvic fins, belly outline rounded .... Atlantic round herring, *Etrumeus sadina* (p. 97)

Origin of dorsal fin not obviously anterior to pelvic fins; belly outline not rounded but more or less sharp-edged 2

2 Belly outline not sharply saw-toothed but with a knife-edge; small but definite teeth on roof of mouth .... Atlantic herring, *Clupea harengus* (p. 94)

Belly outline sharply and strongly saw-toothed; no teeth on roof of mouth 3

3 Posterior margins of scales almost vertical, not rounded, and with fine tooth-like projections .... Atlantic menhaden, *Brevoortia tyrannus* (p. 93)

Posterior margins of scales rounded and smooth 4

4 Lower jaw fitting into notch in upper jaw when mouth closed; gill rakers more than 55 .... American shad, *Alosa sapidissima* (p. 91)

Lower jaw projecting, not fitting into deep notch in upper jaw when mouth closed; gill rakers less than 55 5

5 Peritoneum silvery; eye diameter usually greater than snout length* .... Alewife, *Alosa pseudoharengus* (p. 88)

Peritoneum darkly pigmented; eye diameter usually smaller than snout length .... Blueback herring, *Alosa aestivalis* (p. 87)

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*Although not recorded from our area, *A. mediocris* may be recognized since it has fewer gill rakers on lower part of arch, about 19–21 compared to 30–40 in the alewife.

Blueback herring **Alose d'été**

Alosa aestivalis (Mitchill) 1815

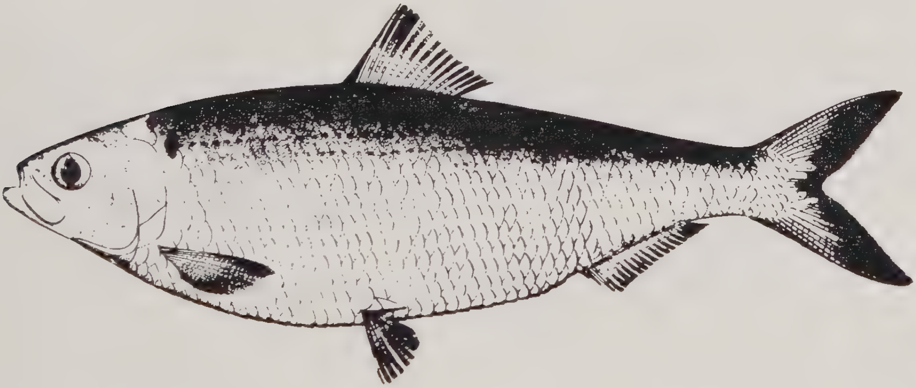
Other common names: mulhaden

Description: The description given for *Alosa pseudoharengus* applies insofar as shape, proportions, and fins are concerned.

Colour, dark-blue or grayish-blue above, the sides and belly silvery; peritoneal lining sooty or blackish.

Distinctions: This species is difficult to separate from the alewife and some authors doubt whether any bluebacks occur in Canada.[268] When fresh the blueback has a dark-blue or bluish-gray back, the alewife a grayish-green one. The most reliable distinction is said to be the sooty to black peritoneum in the blueback as contrasted with the pearl or pinkish-gray peritoneum of the alewife; the writers have found it difficult to separate juvenile specimens even with this criterion.

Size: Similar to the alewife.



Range: A more southern fish than the alewife, the blueback herring is abundant from southern New England to Florida. It is present on the Maine coast and in Nova Scotia.

Canadian distribution: Specimens from the Bras d'Or Lakes, Cape Breton, have been definitely assigned to this species.[49] Late runs, ascribed to this species, occur in the Shubenacadie and Stewiacke rivers in Nova Scotia. The species probably occurs also in other rivers.

Biology and Economics: The blueback is anadromous. The spawning migration is in June—a little later than that of the alewife. Spawning grounds, characters of eggs, growth, and feeding are similar to what has been described for the alewife.

No distinction is made in the catches of alewives and blueback herring and the statistical figures given for the former include both species.

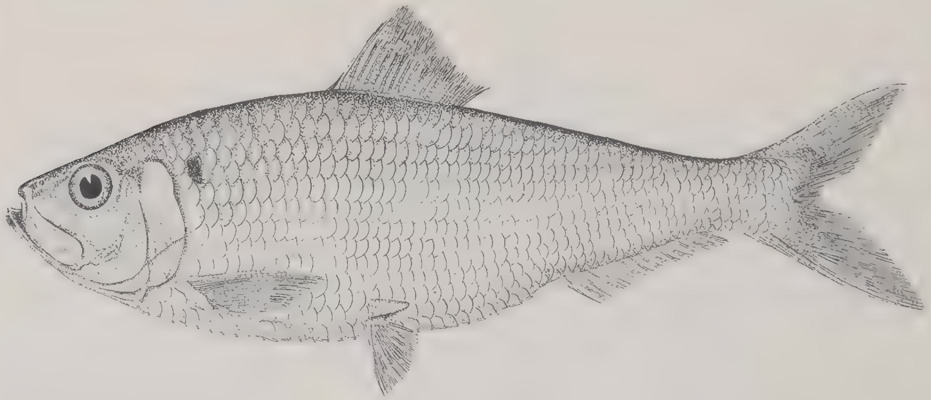
Alewife **Gaspereau**

Alosa pseudoharengus (Wilson) 1811

OTHER COMMON NAMES: gaspereau, sawbelly, kyak or kiack, glut herring, mulhaden (a local name in parts of Nova Scotia)

DESCRIPTION: Body deep, compressed and moderately elongated; depth only 3½ times into length. Eye, 3½–4 in head.[361] Fins: dorsal (1), 14–18; anal, 16–20; pelvic, abdominal; caudal, forked. Ventral edge of body sharp owing to strong keel scutes (19–21 + 13–17) between head and vent. Scales 50 in lateral series. No vomerine teeth.

Colour, grayish-green above and silvery on sides and belly. Sides iridescent when newly caught, especially in small specimens which have a violet sheen. Sea-run individuals have a golden cast on the head and upper parts but this is lost in fresh water. There is a single black spot on each side above eye level and just behind the head. Lining of body cavity pale to dusky.



DISTINCTIONS: The alewife can be confused with the herring and the shad. It can be separated from the herring by the greater body depth (in herring depth goes 4½ times into length) and the absence of vomerine teeth. The number of black spots—two only—distinguish it from the shad which has several or many. Alewives and shad, too small to show pigment, can be distinguished by vertebral number: alewives have 46–50 vertebrae and shad 53–59.

The most troublesome distinction is between the alewife and blueback herring. There is a late run of "alewives" which is usually considered to be another species. They are distinguished by the colour of the lining of the body cavity (see blueback herring).

An interesting variation has been found in the Bras d'Or Lakes, Nova Scotia, where about one-half of the male alewives have a soft belly, with the keel scutes much lighter than usual. The remaining males and all of the females have the typical "saw belly."

SIZE: Up to 14 inches in length, but usually 10–12 inches.

RANGE: Newfoundland and the southern Gulf of St. Lawrence to North Carolina. Occurs, apparently landlocked, in Lake Ontario, Lake Erie, and upper Great Lakes, and in certain lakes in Maine and New York states.

Canadian distribution: The alewife is anadromous, ascending most Canadian rivers from the entrance to Chaleur Bay southward. There are at present no commercial catches in the St. Lawrence, Restigouche, and Annapolis rivers. Alewives spend much of their lives in the sea and are caught incidentally close to shore and occasionally on the Banks. Large catches were made by trawlers southwest of Emerald Bank in early March 1936.[500] The *Rayon d'Or* took 10,000 pounds there on March 11, 1936. They are reported from Georges Bank[49] and over 50 alewives were seen that were trawled near the middle of Georges Bank on April 19, 1950, by the vessel *Albatross III*. On April 27 the same vessel caught five alewives at positions between Browns and Emerald banks. These fish were of both sexes and fully mature.

Young alewives, about 4 inches long, have been caught in Holyrood Pond, St. Mary's Bay, Nfld.[6]

The principal fisheries in Canada are associated with the Miramichi, Margaree, Mersey, Tusket, Gaspereau, Shubenacadie, and Saint John rivers.

BIOLOGY AND ECONOMICS: Alewives spawn in lakes and in the quiet stretches of rivers above the influence of tide. Spawning in the Miramichi system must be largely in the river, there being few connecting lakes. Alewives go farther upstream than shad and negotiate white water in rapids and fishways easily. They do not jump over obstructions. In the Shubenacadie River system in Nova Scotia, alewives enter Grand or Shubenacadie lake; some spawn there; many others move on to Fletcher Run and Rawdon rivers.[104]

The spawning migration from the sea is related to river temperature, hence it is earlier farther south and later in the north. In rivers tributary to the Bay of Fundy the run begins in late April and may last for 2 months. Maturing alewives are caught in Saint John Harbour from late January on but they do not move up river until early April. In rivers tributary to the Gulf of St. Lawrence the run is a little later. In the Margaree River the dates of first appearance of alewives are from May 4 to 27 and the run lasts from a month to 6 weeks. Spawning commences when water temperatures are between 48 and 54 F.

Clear sunny days encourage the alewives to move; this may be a temperature effect. Trap records show that alewives will drop back to a lake from a stream at nightfall.

Female sea-run alewives produce from 60,000 to over 100,000 eggs;[433] landlocked alewives mature earlier and only produce 10,000–12,000 eggs per female.[337] The eggs are about 0.05 inch in diameter and they adhere to sticks, stones, and gravel on bottom. Hatching requires about 3 days at 72 F and 6 days at 60 F.[389]

After spawning the parent alewives drop back to the sea; spent fish have usually left the rivers by July but they have been observed in Prince Edward Island ponds in August, possibly held back by low water in the streams. Spawning marks on the scales indicate that some fish spawn more than once.

The fry are ⅕ inch long and very slender when hatched. Growth is rapid. Transformed fish, 2 inches long, have been caught in Lake Ainslie and Grand Lake, Nova Scotia, in late August. Some fry go down to brackish water soon after hatching. They have been found at ½ inch long in tidal water in the Shubenacadie River, mixed with shad fry, in July. Except in landlocked situations, it is probable that the young alewives all descend to the sea by the end of September. Trap records indicate that fry move downstream both by day and by night.

Alewives mature in 3 years in Massachusetts, but usually in 4 years in Maine.[37] Five-year males from the Maritimes are 7¼ inches long; females of the same age are 8 inches long. One 9-year-old fish, measuring 10½ inches long, was found. Ages of mature fish from Lake Ontario were similar but the size was smaller. Landlocked alewives from the Finger Lakes, New York State, grew at a similar rate to those from Lake Ontario.[337]

The alewife feeds chiefly on plankton. Stomachs of alewives from Minas Basin contained amphipods, mysids, and copepods. It is also reputed to eat small fishes and fish eggs.

While on the spawning migration the alewife does not feed to any extent. Landlocked alewives eat micro-Crustacea, including amphipods, and insect larvae, chiefly chironomids.[337] We found alewife fry in the Shubenacadie River, Nova Scotia, to be taking a similar diet.

Little is known of their enemies in the sea; some are eaten by seals. The fry are eaten by eels, yellow perch, white perch, and probably by other predators.

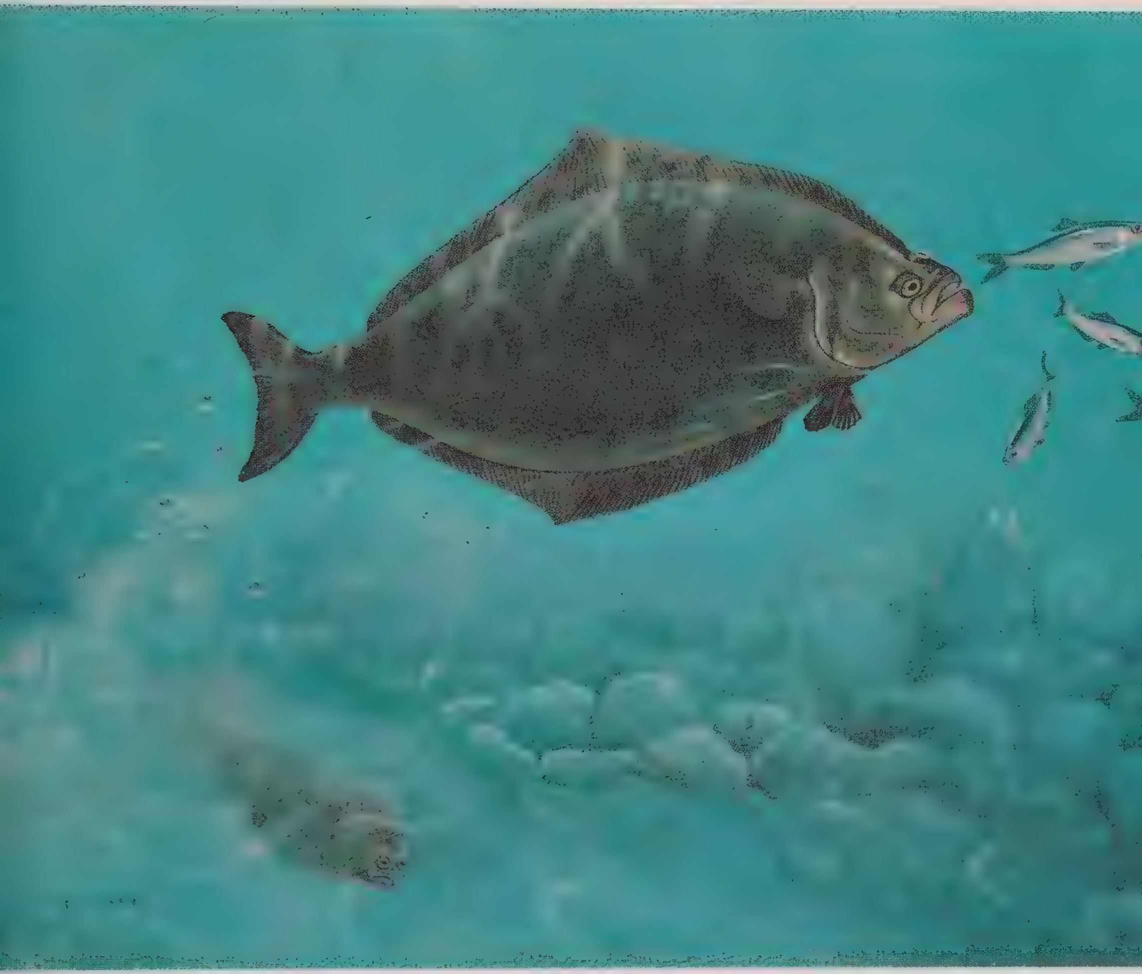
Extensive annual mortalities of alewives occur in early summer in Lake Ontario. These are associated with their entrance into warm water after having been in deep, cold water during winter and spring. It is believed they are killed by the higher temperature.[173]

Alewives are caught in greatest quantity in New Brunswick and Nova Scotia and in Maine and Massachusetts. The maximum annual catch in the United States was about 12 million pounds; in 1940 it was 3 million pounds.[389] The Canadian catch has been high since World War II, reaching a maximum of 38 million pounds in 1952. In 1962 the Canadian catch was 10,626,000 pounds with a value of $177,000.[70b]

The catch of alewives is not necessarily a measure of their abundance as market conditions determine the fishery. The large increase in catch from the Miramichi River and Estuary since 1946 is believed to be due chiefly to improved markets.

Alewives are caught commercially in weirs, as at Saint John Harbour, in gill nets, and by dipping in rapids or in artificially produced eddies in rivers and streams.

To some extent they are used fresh for food and bait, and are also utilized for meal and pet food. A cheap, salted product is exported and is the main outlet. Some are prepared by the same vinegar cure which produces marinated herring.



(Drawn by G. Loates)

Halibut, *Hippoglossus hippoglossus*

American shad

Alose savoureuse

Alosa sapidissima (Wilson) 1811

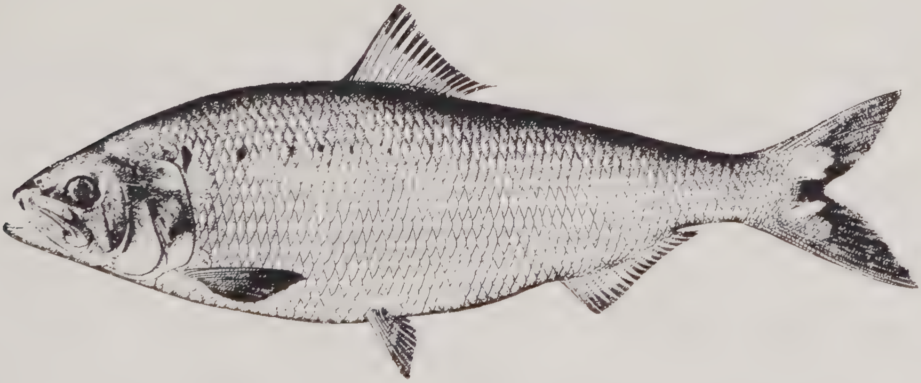
OTHER COMMON NAMES: shad, alose

DESCRIPTION: Body compressed, deep, 4–4½ in length. Eye 5–7 in head (largest in small fish). Fins: dorsal (1), 15–19; anal, 18–24; pelvics abdominal; caudal forked. Ventral edge of body with moderately sharp keel scales (19–23 + 12–19). Lower jaw fitting into notch in upper jaw. Scales large, loosely attached. Vertebrae, 53–59.

Colour, dark-bluish above, whitish-silvery on lower sides and belly, iridescent when fresh from water. A golden tinge over much of the body, particularly pronounced on head, when fat in the sea. One to 3 rows of dark spots on sides, beginning just behind upper part of gill cover; always more than 4 spots and up to 27 in first row in adults; occasionally a second row of 1–16 spots and, rarely, a third row of 2–9.

DISTINCTIONS: Shad can be distinguished from herring by the absence of teeth in the mouth (except in immature specimens); by the lateral dark spots; by the heavier keel scales; and by the greater relative depth. Alewives have only one lateral spot; shad have no "break" in the lines of the lower jaw and body which form a perfect curve; there is a "break" here in the alewife. When other characters fail, as with very small specimens, the vertebral count distinguishes shad (53–59) from the alewife (46–50) readily.

SIZE: Up to a length of 30 inches and a weight of 8–9 pounds. Formerly reported up to 14 pounds but there are no reliable records of such sizes in recent years.



RANGE: Gulf of St. Lawrence to Florida, but reaching the northern limit of range in Newfoundland waters. Introduced on Pacific coast in 1871, it has spread to southern California and Alaska.

Canadian distribution: Anadromous, occurring in coastal waters and coastal rivers, chiefly the

St. Lawrence, Miramichi, St. Mary, Mersey, Tusket, Annapolis, Shubenacadie, Petitcodiac, and Saint John, and the seas adjacent to their mouths. Occasional specimens have been reported from Bay of Islands,[427] Salmonier, Conception Bay, and Bonavista, Newfoundland. Caught occasionally on offshore banks, particularly Sable Island Bank and Middle Ground.[304, 500]

BIOLOGY AND ECONOMICS: The occurrence of American shad in the sea is related to the rivers in which they are known to spawn and it is probable that most of them do not migrate far. Tagging has confirmed this view but has also revealed that some shad do move quite long distances. It is not known what proportion of the stock is migratory. Of over 2000 American shad tagged in the St. Lawrence estuary, 13 were recaptured at distant points from the outer coast of Cape Breton Island to New Jersey and Virginia and three of these were found in the upper Bay of Fundy.[311] Some shad, tagged in United States waters, have been recaptured at Canadian points. For example, a shad, tagged in Virginia in March 1952, was recaptured in the Miramichi estuary in June of the same year.

Shad are anadromous, entering rivers at spawning time. In most rivers they do not go as far upstream as do alewives, although some spawning fish make long journeys, formerly travelling to the Ottawa River and, even now, a few ascend the Saint John River to Grand Falls. Spawning takes place in rivers, not in lakes.

In Canadian waters shad spawn in May and June, ordinarily only after the water temperature reaches 53 F and any depression of the temperature stops the process. When the spring season is retarded, spawning may commence at a late date and at a lower temperature. Spawning occurs in the evening and during the night, usually in areas above still water. The male shad swim vigorously just below the surface, leaving a visible wake but rarely breaking the surface. Fishermen refer to this as "washing." The parent fish return to the sea soon after spawning takes place. Eroded areas on the scales, known as spawning marks, indicate that they may spawn more than once. Scales with five spawning marks have been found.

Female shad produce from 20,000 to 150,000 eggs, depending on size. The eggs are spherical, relatively large, averaging a trifle over $\frac{1}{8}$ inch in diameter. They are slightly heavier than water and settle to bottom but may be carried some distance by the current before coming to rest. Recently fertilized eggs in large numbers and partially developed ones in small numbers can be caught in plankton nets set in the river current below the spawning grounds. The eggs hatch in 12–15 days at a water temperature of 54 F, and in 6–8 days at 63 F. The larvae are $\frac{2}{5}$ inch long when hatched and are very slender. Some drift down to brackish water soon after hatching, others remain in fresh water longer. All have left the rivers by late September when they are from 2 to 3 inches long.

American shad make most of their growth while in the sea. When 2 years old they are about 8 inches long. A few spawn at 4 years but most are 5 years old when they first re-enter fresh water. They are then 18–19 inches long. The oldest shad in the Bay of Fundy are 8 or 9 years old and about 22 inches long. The largest shad in the Gulf of St. Lawrence are somewhat older.

American shad, 11 years old and 23 inches long, have been reported from United States waters.[72]

Long and numerous gill rakers enable the shad to capture large numbers of small planktonic forms, which are their chief food. The larvae and small shad, while in fresh water, eat copepods and related crustaceans, and insect larvae, chiefly chironomids. All sizes that occur in the sea take copepods and mysids most frequently, along with small amounts of a wide variety of other planktonic animals. Some adult insects that have fallen into the water are also eaten. The presence of some bottom-living copepods in the stomach indicates that they sometimes feed very close to bottom. Fishes, small smelt, and sand lance make up a very small part of their food.

Little is known of the enemies of this species. Half-grown shad have been found in seal stomachs. Monkfish eat full-grown shad which have been caught in weirs.

American shad are caught commercially in Nova Scotia, New Brunswick, and Quebec, and in larger amounts along the Atlantic seaboard of the United States. The maximum Canadian catch on record was 3⅓ million pounds in 1875. In 1896 the United States catch was over 50 million pounds. Since 1900 the catch in both countries declined markedly. The Canadian catch in the early 1950s approached its former high level but has since declined again. The catch for the Canadian Atlantic area for 1962 was 517,000 pounds, with a value of $36,000.[70b]

The catch in the eastern United States in 1949 was 8½ million pounds.[277]

American shad are caught in weirs, traps, and gill nets, chiefly in the rivers and estuaries, while they are on the spawning migration. Small sea fisheries exist and these catch fish of better quality.

Shad are used fresh and salted and the roe is also in particular demand.

Atlantic menhaden Alose tyran

Brevoortia tyrannus (Latrobe) 1802

Other common names: menhaden, pogy, mossbunker

Description: Body compressed, deepest behind eye, tapering to tail, depth 3 in body; head large. Eye 6 in head. Fins: dorsal (1) 19; anal 20; pelvics abdominal; caudal deeply forked. Ventral edge with keel scales. Scales serrated, irregularly arranged, crowded anteriorly. Vertebrae about 48.

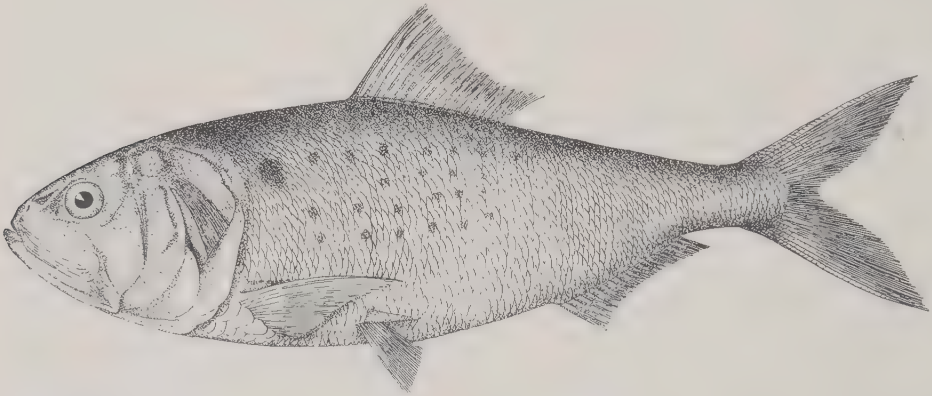
Colour, bluish, greenish, or brownish above; sides silvery with brassy lustre. One conspicuous dusky spot on each side behind gill opening, with several irregularly arranged smaller spots behind this.

Size: Up to a length of 20 inches, but usually 15 inches or less.

Range: Western Nova Scotia to Florida.

Canadian distribution: Usually occurs only as a stray. It was reported from Saint John and the lower Bay of Fundy a century ago.[348] One specimen was found at Saint John more recently.[205]

Many specimens, ranging in size from 5 to 14 inches long, have been reported in recent years, one from Passamaquoddy Bay in 1947, one from Mace's Bay in 1952 and one from Passamaquoddy Bay in 1954. Two or 3 dozen were caught in one weir and about 150 in the second at Northwest Harbour, Deer Island, Charlotte County, N.B., on October 6–7, 1960. Large numbers were reported in the weirs in Western Passage and Cummings Cove area at the same time.



BIOLOGY AND ECONOMICS: The Atlantic menhaden, like the herring, is a truly marine species and spawns at sea. The eggs are spherical, moderately large ($^1/_{14}$ inch in diameter) and float in the water; they have a small oil globule. In the northern part of its range the Atlantic menhaden spawns during June, July, and August. While they may mature in their fourth summer, some menhaden reach an age of 8–9 years. They travel in large schools and are plankton feeders, using their gill rakers to strain food organisms from the water. Their food consists chiefly of copepods and euphausiids but they are unique in eating quantities of small planktonic plants (diatoms).

The Atlantic menhaden is eaten by many predators including whales, porpoises, cod, pollock, silver hake, swordfish, and bluefish.[49]

Obviously the Atlantic menhaden is of no commercial importance in Canadian seas. Farther south large catches are made, sometimes near shore, sometimes up to 50 miles offshore. They are caught in purse seines and traps. In 1949 about 5 million pounds were caught along the coast of Maine.[404] They are used for the manufacture of oil, fertilizer, and fish meal.

Atlantic herring Hareng atlantique

Clupea harengus harengus Linnaeus 1758

OTHER COMMON NAMES: sea herring, sardine, hareng

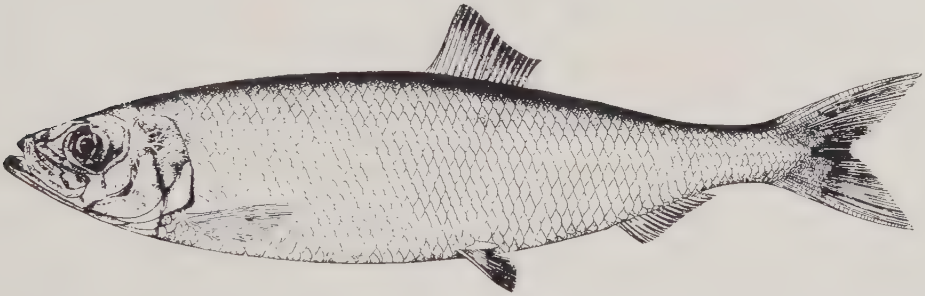
DESCRIPTION: Body deep, 4½ in length, compressed; eye 4 in head; mouth large, lower jaw projecting slightly. Fins: dorsal (1), 16–22; anal, 15–21; pelvics abdominal, below dorsal; caudal forked. Ventral edge of body sharp or slightly rounded, keel scutes weak (26–29 + 11–

16). Scales large, loosely attached, about 57 in lateral series. Vertebrae, 51–59. Vomer with patch of small, permanent teeth.

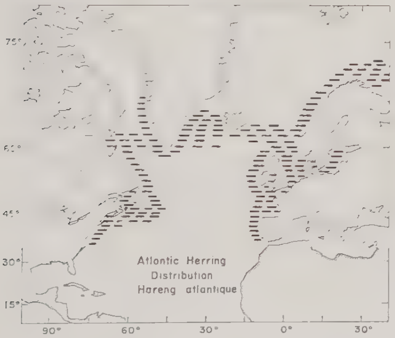
Colour of back bluish or greenish-blue, sides and belly silvery, gill covers sometimes golden or brassy; when fresh from water generally iridescent with shades of blue, green, and violet.

Distinctions: Can be distinguished from shad and alewives by weak ventral keel scutes, reduced body depth and absence of black spots on sides, and by the presence of vomerine teeth.

Size: Up to a length of 17 inches and a weight of 1½ pounds.



Range: Although abundant economically only in the centres of its range between Newfoundland and Maine, the herring is distributed along the North American coast of the Atlantic from northern Labrador and west Greenland to as far south as Cape Hatteras. Recent studies in the Arctic have verified early records that the Atlantic herring is found north to Cape Bathurst in the Beaufort Sea.[402] On the European coast its range extends from Iceland and the intervening seas to Europe, where it occurs from Spitzbergen and the White Sea to the Straits of Gibraltar. It is found in the Baltic Sea up to the Gulf of Bothnia and the Gulf of Finland.[221] Another subspecies, *C. h. pallasii*, occurs in the North Pacific.



Canadian distribution: Abundant as far north as Hamilton Inlet, Labrador, around Newfoundland, the Maritime provinces and Quebec; limited by brackish water, it penetrates the St. Lawrence estuary only to L'Islet. Chiefly caught within a few miles of land but widely distributed over the Gulf of St. Lawrence and the offshore banks. Immature herring, known locally as "sardines," occur on many parts of the coast and are concentrated in the lower Bay of Fundy and to a lesser extent in the St. Lawrence estuary near the mouth of the Saguenay River.

Biology and Economics: Recent studies on Canadian Atlantic herring indicate that six or more distinct populations exist along the coast. Hence extensive migrations are improbable, although there is probably some mingling of these populations. That the species can move over long distances has been shown by tagging of herring at Iceland and Norway where marked fish have been tagged at one place and recaptured at the other.[149] There is no evidence of such extensive migrations by herring in Canadian Atlantic waters.

Spring spawners approach shore but summer and autumn spawning seems to take place offshore. At spawning time, and also while immature, herring may form great schools. However, the largest schools on record have occurred 4 or 5 months prior to spawning but it is probable that such aggregations were associated, in some way, with the spawning process. In general, large schools are formed in association with low temperature conditions and spawning.

There is some indication that water movements are important in determining where larger herring go. Little is known of their migrations on the banks. In their early stages the larvae are carried by currents and may thus journey passively hundreds of miles.

The known breeding grounds for herring are mostly near shore. At the Magdalen Islands and in Fortune Bay, Nfld., spawning takes place in the shallow water close to shore and the water may be milky with the reproductive products; in these localities storms bring the eggs ashore in windrows. Although spawning occurs mainly in May and August, throughout the Canadian area the time of spawning varies greatly and somewhere fish are spawning each month from April to November, with each area having its characteristic spawning time and place.

The number of eggs laid depends upon the size of the female, larger fish producing more eggs. From a female 13¾ inches (345 mm) in length, 72,065 eggs have been counted. The size of egg may vary from $1/25$ to $1/18$ inch in diameter. The eggs sink to the bottom and adhere to solid objects including other herring eggs. The hatching time is dependent on water temperature and is reported to be 11 days at 50 F.[49] The larvae when hatched are about ¼ inch long and very slender. They remain slender until they are about 50 mm or 1½ inches long.

The growth of the Atlantic herring has been a subject of much study and growth rates for various parts of the Canadian coasts have been published in the Journal of the Fisheries Research Board of Canada. Herring scales become difficult to interpret or to "read" accurately when the herring are very old but some reach an estimated age of 20 years. Samples of commercial catches in the southern Gulf of St. Lawrence contain fish from 3 to 18 years old and up to 17 inches long; catches from the west and south coasts of Newfoundland contain fish from 3 to 18 years old and up to 15 inches long. Growth is somewhat more rapid on the outer coast of Nova Scotia where 9-year-old herring average 14 inches in length.[266]

Atlantic herring are plankton eaters and their chief food consists of crustaceans such as copepods and euphausiids.[32] Other organisms eaten include mollusc larvae, fish eggs, Sagittae, pteropods, and the larvae of sand lance, silversides, herring, and capelin.[462] The numerous, long gill rakers are able to filter these organisms from the water which passes over the gills.

The Atlantic herring is preyed upon by most of the larger species of fish inhabiting the same areas and by the warm-blooded animals as well. They are eaten by cod, silver hake, salmon, tuna, sharks, dogfish, squid, sea birds, seals, porpoise, and whales, and probably by others. In general, herring are preyed upon by all pelagic predators and constitute the basic food for many of these.

Although Atlantic herring are caught in Canadian Atlantic waters over a wide area the existing fishery is mostly inshore and it has not been necessary to exploit the offshore potentialities to supply the market. Anchored gill nets, weirs, and traps are the chief gear used; purse seines are used in Newfoundland and in the Bay of Fundy.

It is believed that the maximum annual catch of herring in eastern Canada was about 188,000 metric tons. The catch for the Canadian Atlantic area for the year 1962 was 235,245,000 pounds, with a value of $3,398,000.[70b]

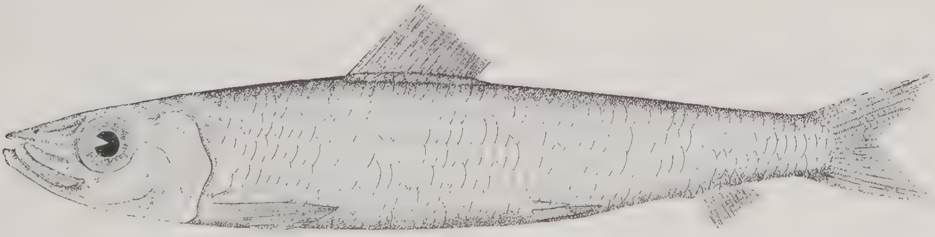
Herring are used fresh and frozen as human and animal food and as bait. They are also salted; and smoked as kippers and bloaters. The smaller-sized fish are canned as sardines, the larger ones as kipper snacks and fillets. Fillets from salted herring are cured in vinegar and spices. Some herring are canned for pet food; the refuse and sometimes whole herring are reduced to fish meal and oil. Oil content of raw herring averages 5–9% for spring-caught and 10–15% for summer-caught fish and they rarely contain less than 2%.

Atlantic round herring — Shadine

Etrumeus sadina (Mitchill) 1815

Description: Body slender, fusiform, belly rounded, depth 6 in length. Mouth small, maxillary reaching front of orbit. Eye large, 4 in head. Fins: dorsal (1), 18, in front of pelvics; anal 13; caudal forked. Vomerine teeth present. Scales large, loosely attached.

Colour, olive-green above; sides and belly silvery.



Distinctions: This species can be distinguished from the Atlantic herring by the rounded belly, the position of the dorsal fin, and by the smaller number of anal fin rays.

Size: Length up to 10 inches.

Range: The Atlantic round herring occurs from Cape Cod to the Gulf of Mexico, occasionally straying to the mouth of the Bay of Fundy.

Canadian distribution: Atlantic round herring are confined to the lower Bay of Fundy. In October 1937, several hogsheads were taken in a weir at Campobello, N.B. and smaller quantities at Grand Manan.[304] A small number of specimens were seen in late summer of 1952 and 1953 from Passamaquoddy Bay and from the Point Lepreau area.

Biology and Economics: This species is of no commercial value in Canada. Landings of over 200,000 pounds were reported from Maine in August and September 1952, but this was unusual.[399]

Family ENGRAULIDAE Anchovies

Striped anchovy **Piquitinga**

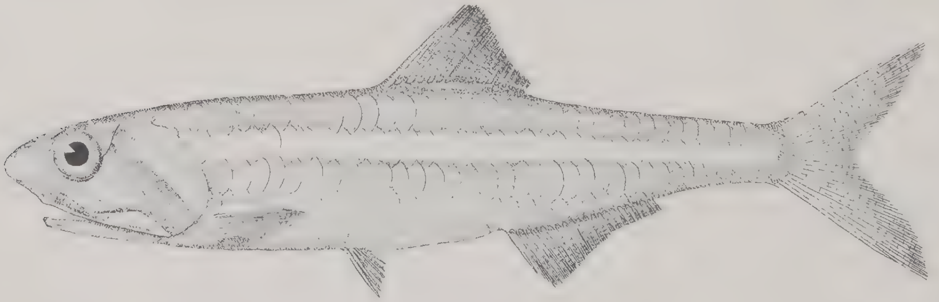
Anchoa hepsetus (Linnaeus) 1758

Description: Body elongate, moderately compressed. Head 3.3–4.0 in length, snout moderately long, projecting much beyond tip of lower jaw; mouth large, on lower side of head, teeth moderately strong. Eye large, 3½ in head. Fins: dorsal (1), 13–16, origin equidistant between eye and base of caudal; anal, 18–23, origin under last rays of dorsal, a sheath of scales at its base; pectorals, 13–15, with large axillary scale; pelvics abdominal, also with large axillary scale; caudal forked. Scales large, cycloid, about 40 in lateral row.

Colour, pale-gray, iridescent; some green and yellow pigment on upper surface of head; a silvery band on each side of body, running at eye level from opercular opening to base of tail, about as wide as pupil of eye; under parts silvery.

Distinctions: The striped anchovy can be readily distinguished from the herring by its markedly projecting snout and very large mouth. The single dorsal fin separates it from the silverside, which has two.

Size: Maximum length about 6 inches.



Range: Abundant from Chesapeake Bay to the West Indies and Uruguay. Taken as a stray in Nova Scotia and Maine. One record only; five specimens, between 2 and 2½ inches long, were caught in Bedford Basin, N.S., on September 29, 1931.[498]

Family ALEPOCEPHALIDAE Smoothheads

These are deep-sea, isospondylid fishes allied to the clupeoid or herring-like fishes. Characteristically these fishes have weak teeth, the gill openings are wide, photophores absent or not well developed, scales are cycloid and thin or absent, the dorsal fin is inserted far back, over the anal fin, there is no adipose fin, the pelvic fins are abdominal and the pectoral fins are short and somewhat elevated on the sides.

Like many deep-sea groups, the relationships within this family are not clear. Two species have been reported.

KEY to Family ALEPOCEPHALIDAE

Scales (cycloid) present and well developed; lateral line present ....
.... Baird's smoothhead, *Alepocephalus bairdii**

Scales absent; skin thick; no lateral line ....
.... Atlantic gymnast, *Xenodermichthys socialis* (p. 99)

Atlantic gymnast **Gymnaste atlantique**

Xenodermichthys socialis Vaillant 1888

Description: Body rather elongate, compressed, greatest depth 6 in total length, occurring at base of pectoral fin, body tapering gradually to a moderate caudal peduncle. Head 4 in total length, upper profile steep and rounded; mouth terminal, low on head, angle under middle of eye, lower jaw projecting very slightly, small teeth in both jaws. Eye large, horizontal diameter 2½ in head, placed high and forward on head. Fins: dorsal (1), 29–30, fin low and rounded, longest rays towards middle, 3 in head, base of fin equals head length, origin far back on body, ending on caudal peduncle; caudal rather small, slightly forked; anal 28, similar in size and shape to dorsal and located under it; pectorals small, longest rays 4 in head, located low on sides just behind gill opening; pelvics larger than pectorals, longest rays 3 in head, located ventrally nearer to anal fin than to pectorals. Skin thick, scaleless, numerous tubercles on sides and ventral surface. No lateral line apparent.

Colour uniformly blackish.

Distinctions: Distinguishing features are the blunt snout, posterior position of the dorsal and anal fins and the large eye. This species is separable from *Bathy-*

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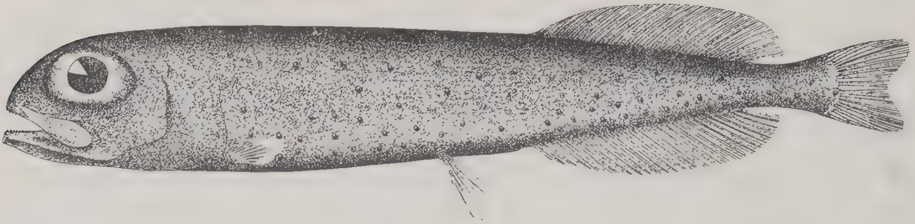
* *Alepocephalus bairdii* Goode and Bean 1879 (=*Mitchillina bairdii* (Goode and Bean) 1879) has been reported by Goode and Bean to occur off Grand Bank and, in fact, the type locality of *A. bairdii* is given as the Grand Bank, taken at a depth of 200 fathoms. Halkett[184] repeated the Goode and Bean report. McAllister[291] also listed *Mitchillina bairdii* (Goode and Bean). A detailed account of the species has been omitted for want of confirming evidence.

troctes, which it resembles, by the absence of scales and the presence of tubercles on the body, particularly the lower parts.

SIZE: The type specimen was 3¼ inches long.[170]



RANGE: Probably unknown. Reported from the southern tip of the Grand Bank; and from deep water (2949 fathoms) 300 miles east of Chesapeake Bay.[170]

Canadian distribution: Taken only once; by the M. V. *Blue Foam*, at the southeastern tip of the Grand Bank at lat 43°04′N, long 49°48′W in October 1950. The depth was 57–60 fathoms.[6]

Suborder SALMONOIDEA—SALMON-LIKE FISHES

The salmonoid fishes, like the clupeoids, comprise a large number of marine and freshwater species. The shape of the body is generally elongate, the scales are cycloid, small and inconspicuous (trouts), or large and deciduous (argentines), an adipose fin is usually present, oviducts usually incomplete, photophores absent. and teeth well developed, weak, or absent.

Canadian Atlantic salmonids are classified in four families: Salmonidae (salmon, trouts, whitefishes), Osmeridae (smelts), Argentinidae (argentines), and Bathylagidae. The latter family occurs primarily in deep water. Of these families the Salmonidae and the Osmeridae are the most widely distributed and the best known in the Canadian Atlantic area.

KEY to Families of Suborder SALMONOIDEA

1 Gill membranes separate or free; gill opening wide (branchiostegals 6 or more) 2

Gill membranes united or joined; gill opening restricted (branchiostegals 3 or 4) 4

2 Dorsal fin inserted in advance of pelvic fins .... Argentines, family Argentinidae (p. 121)

Dorsal fin inserted over pelvic fins 3

3 Pelvic axillary process well developed; vertebrae at base of caudal fin upturned .... Salmon, trouts, chars, whitefishes, family Salmonidae (p. 101)

No pelvic axillary process; vertebrae not conspicuously upturned at base of caudal fin .... Smelts, family Osmeridae (p. 117)

4 Dorsal fin inserted over pelvic fins ... Blacksmelts, family Bathylagidae (p. 124)

Dorsal fin inserted in advance of pelvic fins .... Argentines (*Nansenia*), family Argentinidae (p. 121)

Family SALMONIDAE Salmon, trouts, chars, whitefishes

This well-known and famous family of sport and commercial fishes is widely distributed throughout both fresh and salt waters of the northern hemisphere. The salmonids are cold water fishes and they are anadromous, that is, although many of the species range widely in salt water, all species must return to the fresh waters of lakes and streams for successful spawning.

The salmonids are robust-bodied, much less compressed laterally than the clupeoids, although the whitefishes are more compressed than the trouts and chars. The typical features are: soft rays in the fins, cycloid scales, an adipose fin on the back, a distinct pelvic axillary scale or process, and the last 2–3 vertebrae are upturned dorsally; the caudal fin is not usually deeply forked; teeth are well developed on jaws, tongue and vomer in the salmon, trouts, and chars, but weakly developed or absent in whitefishes; these latter fishes are silvery and lack bright colours while the salmon, trouts, and chars are frequently bedecked with orange and orange-red tones—especially the male char during spawning season.

In North America the whitefishes are often classified in a separate family, the Coregonidae.

Eight species of salmonids are known to occur in the Canadian Atlantic area, three of these, the brown and rainbow trouts and the pink salmon, as a result of introduction.

KEY to Family SALMONIDAE*—Salmon and Trouts

1 Scales small, those in lateral line 115–200; teeth well developed on jaws and vomer; caudal usually truncate, occasionally forked; young (6 inches or less) with dark vertical blotches (parr marks) on sides (except *O. gorbuscha*) .... Salmon, trouts, chars 2

Scales large, those in lateral line 100 or less; teeth weakly developed or absent; caudal fin distinctly forked; parr marks absent; colour silvery .... Whitefishes (*Coregonus* spp.) 7

2 Anal rays 13–19 (usually 14–16); body and caudal fin with black spots .... Pink salmon, *Oncorhynchus gorbuscha* (p. 105)

Anal rays 7–12 (usually 9–11); body and tail fin with or without black spots .. 3

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* When in the sea, body pigmentation is usually masked by heavy silvery colouration. The characters enumerated in the key will be evident if the specimen is examined carefully.

3 Black spots present on head and body (young *S. salar* have red spots between parr marks); scales conspicuous, fewer than 165 in lateral line; pelvic and anal fins without white leading edges; vomer flat with teeth extended backward in 2 rows 4

Light spots, not black spots, on body, these spots being pink, red, or cream in colour; lower fins with snow-white leading edges; vomer boat-shaped, teeth on the anterior part only 6

4 Caudal fin distinctly marked with radiating rows of black spots; body never with red spots; anal fin usually with 10 or 11 rays; adipose fin often with a black margin .... Rainbow trout, *Salmo gairdneri* (p. 106)

Caudal fin usually unspotted, never with regular rows of black spots; reddish spots sometimes on body; anal fin with 8–11 rays; adipose fin without black margin 5

5 Maxillary to below centre of eye in 6-inch fish, seldom far behind eye (except in large males); gill cover with 2 or 3 large spots only; branchiostegals usually 12; dorsal fin rays usually 11; vomerine usually not well developed; small fish have red spots between parr marks; no red on adipose fin .... Atlantic salmon, *Salmo salar* (p. 107)

Maxillary to below last half of eye on 5-inch fish, and extending well beyond eye in larger fish; gill cover usually with many small spots; branchiostegals usually 10; dorsal fin rays usually 9; vomerine teeth well developed; rust-red spots sometimes on adults and often on margin of adipose fin .... Brown trout, *Salmo trutta* (p. 111)

6 Caudal fin square or nearly so; dorsal and caudal fins with distinct wavy lines or blotches; back usually vermiculated; sides with pink or red spots, many of which have blue borders (young with 8–10 parr marks on sides) .... Brook trout, *Salvelinus fontinalis* (p. 114)

Caudal fin forked; back without spots or markings; dorsal and caudal fins dusky, never with wavy lines or spots; spots on sides cream to pink, sometimes red but never with blue borders (young with 11–13 parr marks) .... Arctic char, *Salvelinus alpinus* (p. 112)

7 Scales in lateral line more than 90 (91–100); mouth terminal; teeth on premaxillaries, palatines and vomer small but present, even on adults .... Atlantic whitefish, *Coregonus* sp.* (p. 104)

Scales in lateral line less than 90 (70–85); mouth inferior, obviously overhung by snout; small teeth on premaxillaries, palatines, and vomer of juveniles (under 100 mm long) only .... Lake whitefish, *Coregonus clupeaformis* (p. 103)

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* This seagoing whitefish represents an undescribed species currently being studied.

Lake whitefish — Corégone de lac

Coregonus clupeaformis (Mitchill) 1818

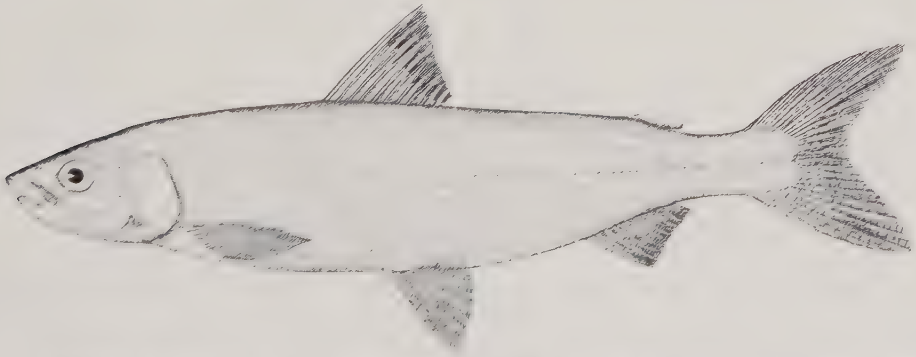
OTHER COMMON NAMES: common whitefish, whitefish

DESCRIPTION: Body elongate, compressed, greatest depth 4-4½ in total length; caudal peduncle depth 13 in total length. Head small, compressed, length 5-6 in total length; snout blunt, mouth subterminal, angle of mouth under front of eye, teeth very minute but sometimes present on palatines and tongue of young specimens; two flaps between nostrils. Eye moderate, 4-5 in head. Fins: dorsal (1) 11, 2nd or 3rd rays longest 1⅓ in head, subsequent rays decreasing evenly until last ray is 4 in head, base of fin 1¾ in head, origin of fin a little more than twice head length from snout; adipose height 4 in head, located just before caudal peduncle; caudal moderately large, forked, tips of lobes pointed; anal 11, 2nd or 3rd ray 1½ in head length; subsequent rays decreasing, length of base 1½ in head, posterior edge of anal under posterior edge of adipose; pectorals pointed, longest rays 1⅓ in head length, base low on sides behind gill opening; pelvics about same length as pectorals but wider, base very low on side under middle of dorsal fin. Lateral line straight, extending from upper part of gill opening to middle of base of caudal fin. Body covered with moderately large scales usually 70–85 in lateral line, one large pointed scale (axillary scale or axillary process) above base of pelvic fins.

Colour olivaceous above, sides silvery, white below; paired fins usually light, median fins sometimes dusky, but amount of pigment variable.

DISTINCTIONS: The lake whitefish has an inferior mouth, the Atlantic whitefish a terminal mouth. The lake whitefish can be distinguished from any of the herring family by its adipose fin. The absence of prominent teeth and the small mouth distinguish it from other fishes with an adipose fin, such as salmon, trout, and smelt. The smelt and capelin also lack the pelvic axillary process.

SIZE: Up to a length of 2 feet.



RANGE: Northern North America, chiefly in lakes, sometimes in rivers, from the Great Lakes northwards; occasionally found in brackish water. Related species occupy similar positions in Europe and Asia.

Canadian distribution: The lake whitefish occurs mainly in fresh waters from Newfoundland to British Columbia and in the Yukon and Northwest Territories; it is absent only in Prince Edward Island[124] and Nova Scotia.[62] In the Atlantic provinces it has been reported in fresh water in Labrador;[25] and in New Brunswick in several lakes and the lower Saint John River.[425, 441] The species was introduced into lakes near St. John's, Nfld., in 1886.

In marine situations it has been reported very sparingly. One specimen was caught in salt water off Blacks Harbour, N.B.[265] Elsewhere they have been reported in salt water along the east coast of James Bay;[269, 270] and on the shores of Hudson Bay;[126] they have been caught in brackish water adjacent to Ungava Bay but not in the Bay itself.[124]

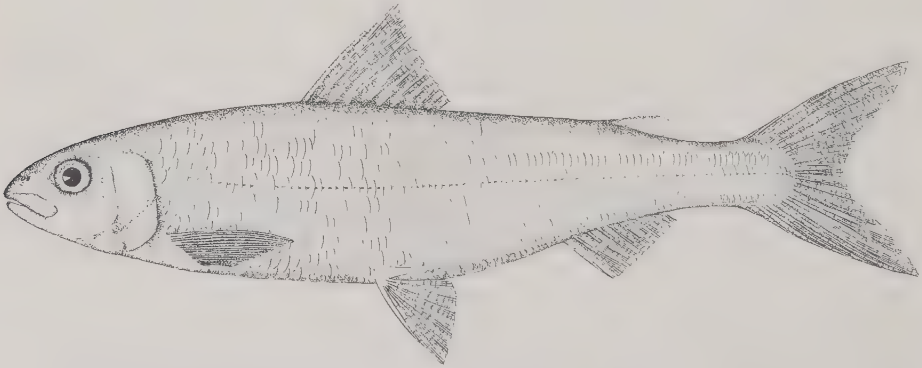
BIOLOGY AND ECONOMICS: The life history of the whitefish is quite well known. They begin to spawn when about 14 inches long, or when about 4 years old. Spawning occurs in October or November when the eggs are deposited on the hard bottom, here to develop until hatching in March or April of the following year. Growth varies greatly from place to place. They are mainly bottom feeders, the chief food of the adults being amphipods, molluscs, and insect larvae.[188, 189]

Lake whitefish rank high in Canadian freshwater fisheries but are of no significance to the marine fishery.

Atlantic whitefish — Corégone atlantique

Coregonus sp.

DESCRIPTION: Body fusiform, laterally compressed, greatest depth 4½–5½ in total length. Head about 5 in total length, snout blunt, mouth terminal or nearly so; minute teeth present on premaxillaries, vomer, palatines and tongue and at all ages; gill rakers usually 23–27; eye moderate, 4–6 in head. Fins: dorsal (1), 10–12 fully developed rays, preceded by one to 3 short unbranched rays; adipose well developed, its length 13–16 times in standard length; caudal fin well developed, forked, the lobes pointed; anal, 9–12 fully developed rays, preceded by one or 2 short unbranched rays; pelvics well developed, wide, length about 1½ in head length; pectorals narrower, length about 1½ in head length. Lateral line straight, scales moderate, 91–100 in lateral line. Pelvic axillary process or scale well developed equalling or exceeding maxillary length at all sizes; pectoral axillary scale also well developed at times.



Colour generally silvery, scattered over with black pigment; dark-blue or dark-green on back, light below; lower fins light, median fins dusky; somewhat darker than lake whitefish in general colouration.

DISTINCTIONS: The Atlantic whitefish differs from the lake whitefish in having a near terminal mouth, smaller scales, and small but well-developed teeth on the premaxillary, vomer, palatine bones, and tongue even on large adult fish.

SIZE: to a length of about 20 inches.

RANGE: Occurs only in certain lakes and rivers of Nova Scotia, moving down stream to the sea in some regions.

Canadian distribution: Known to occur only in Millipsigate Lake and Tusket River in Nova Scotia but probably occurs in other Nova Scotia lakes.

BIOLOGY AND ECONOMICS: For many years this species was not recognized as a distinct species but was confused with the lake whitefish. Consequently its life history and general biology are not known. It is the more seagoing of the two whitefishes occurring in the area.

Specimens taken in Yarmouth Harbour were found to be feeding on amphipods and small periwinkles (*Littorina littorea*) and other marine invertebrates.

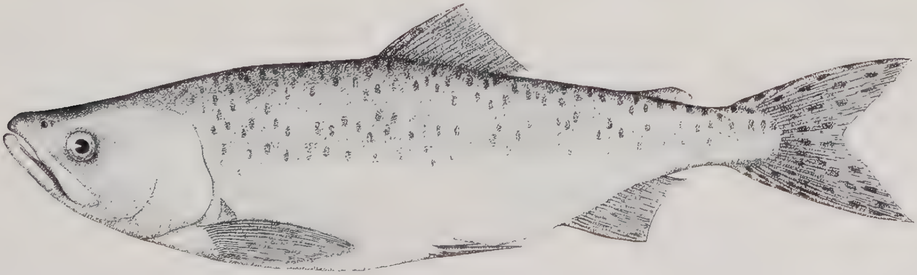
Pink salmon — Saumon rose

Oncorhynchus gorbuscha (Walbaum) 1792

The pink or humpback salmon is native to the Pacific slope of North America. Attempts have recently been made to introduce the pink salmon into Newfoundland waters. The sites of introduction have been the rivers at the head of St. Marys Bay in the southern part of the Avalon Peninsula. The success of the venture is not yet known.

The introduction took the form of planting eyed eggs in suitable portions of the selected rivers. On November 5, 1958, 2 quarts (5700) of eyed eggs were planted in the North Harbour River to determine overwinter survival rate and the time required to hatch. Egg survival proved to be 62%, and the fry emerged between May 7 and June 5, but none of the fry were permitted to escape to sea.

In November 1959, 250,000 eyed eggs obtained from the Indian River in British Columbia, were planted in the North Harbour River. Fry survival in the spring of 1960 was of the order of 38% and the majority of the fry moved downstream between May 11 and May 20, 1963. In the fall of 1962, a planting of 2,500,000 eggs was made in the same place and a fry survival of about 84% was indicated. During May and June of 1963 the recently hatched fry moved down-



stream to the sea. Subsequent study during the next 2 months showed that fry moved many miles from the mouth of the North Harbour River.[13, 14, 15, 16] On the Pacific coast pink salmon, on hatching, at once move downstream to the sea, remaining there for that year and then return in the fall of the following year as 2-year-olds, to spawn.

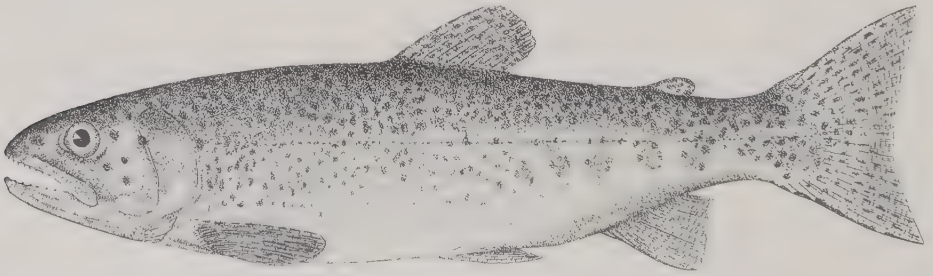
DISTINCTIONS: Pink salmon have a longer anal fin than any other trouts or salmons to be found in the Atlantic area. In fact all Pacific salmon of the genus *Oncorhynchus* have long anal fins. The rays in the anal fin usually vary in number from 14–16 (extreme 13–19), while for all others in the area the anal fin rays range from 9 to 11 (extreme 7–12). Pink salmon are characteristically sparsely spotted with somewhat elongate black markings on the back and upper parts of the sides and on the tail fin. The only other east coast salmonid having a spotted caudal or tail fin is the rainbow or steelhead which has a profusion of small black spots. The body of the pink is also more strongly compressed laterally than its Atlantic relatives and when in spawning migration the males have a pronounced hump on the back in front of the dorsal fin, giving rise to another name by which they are known, humpback salmon.

Rainbow trout — Truite arc-en-ciel

Salmo gairdneri Richardson 1836

OTHER COMMON NAMES: steelhead, Kamloops trout

DESCRIPTION: Body elongate but stout, greatest depth 5 in total length, occurring at origin of dorsal fin, slightly compressed, caudal peduncle stout. Head about 5 in total length, roundly pointed, somewhat compressed; mouth terminal, angle under posterior edge of eye, teeth on vomer poorly developed, no teeth on back of tongue. Eye moderate, 5½ in head. Fins: dorsal (1), 11–12, 3rd or 4th ray longest being 3⅓ in head, subsequent rays shorter, base 1¾ in head, situated on middle of back, adipose nearer base of caudal than end of dorsal; caudal large, forked; anal 9–12 (usually 10 or 11), a little higher than dorsal but shorter, its posterior end under adipose fin; pectorals triangular, length 2 in head, located low on side under posterior edge of gill cover; pelvics abdominal, situated ventrally under middle of first dorsal. Lateral line prominent, nearly straight. Scales small.



Colour, metallic-blue on dorsal surface; silvery on sides; black spots on back and on dorsal, adipose, and caudal fins each without a halo; continuous deep-pink to red band along each side of body, especially in spawning males. Atlantic sea-run individuals usually lack this reddish band and have an overall silvery appearance.

DISTINCTIONS: The serial arrangement of spots on the caudal fin and the pigmented border around the adipose fin are useful characters in the identification of this species. See Key for additional features.

SIZE: Sea-run fish may attain lengths of 45 inches and weights up to 36 pounds in native British Columbia waters but sizes are much smaller on the Atlantic coast. Fish up to 5 and 6 pounds are known from Prince Edward Island ponds and estuaries.

RANGE: Southern California to southeastern Alaska, entering rivers. Introduced in all the Canadian provinces from Saskatchewan to Newfoundland.[423] Successfully introduced into the Great Lakes region, New York, and New England states.

Canadian distribution: The rainbow trout occurs naturally in the coastal and inland waters of British Columbia eastward into Alberta. It has been introduced in all the provinces from Saskatchewan eastward. In New Brunswick it occurs in MacFadden's Lake and Crooked Creek, Albert County, in Clear Lake and Crecy Lake, Charlotte County, and in the Saint John River.[76, 425] In several ponds and streams in Prince Edward Island; occasionally running to sea, as at Wilmot River[265] and off the Dunk, Cardigan, and Montague rivers.[532] Successful introductions have been made in lakes in Kings, Annapolis, and Digby counties, Nova Scotia, and although no sea run has been established some fish are suspected of having gone to sea.[532] Ponds near St. John's, Nfld., have been stocked since 1886 but no sea-run populations have become established.

BIOLOGY AND ECONOMICS: The rainbow trout in the Maritime Provinces behave essentially the same as in the native waters of the Pacific coast, that is the species may go to sea but it usually remains in fresh water. Landlocked populations occur in lakes without access to the sea, of course, but even where ready access is available, fish may or may not migrate.

Spawning takes place in spring and, with higher water temperatures, the eggs develop rapidly.

On the Pacific Coast the sea-run group spend 1 or 2 years in fresh water and then go to sea, returning to fresh water at maturity.

On the Pacific Coast this trout is a renowned game fish and also has some commercial importance, but on the Atlantic coast it is utilized only as game fish.

Atlantic salmon Saumon atlantique

Salmo salar Linnaeus 1758

OTHER COMMON NAMES: salmon, ouananiche, black salmon, grilse, kelt

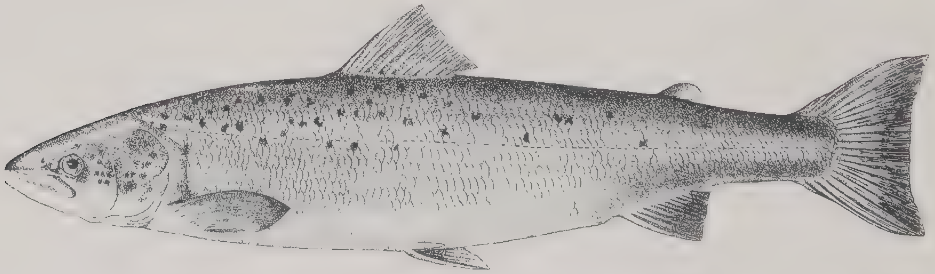
DESCRIPTION: Body elongate, somewhat compressed; caudal peduncle slender. Head small, flattened above, 5–6 in length; mouth terminal, maxillary extending slightly beyond posterior border of eye only in large adults, otherwise to below eye; teeth on jaws and on crest and shaft of vomer (shaft teeth sometimes lost on old fish). Eye moderate, 9 in head. Fins: dorsal (1), 11–12, inserted midway between snout and tail, height of forward edge equalling length of base; adipose small, elongate, inserted over middle of anal; caudal heavy, forked in young, concave in adults; anal, 8–11, smaller than dorsal, just behind vent; pelvics abdominal, under posterior portion of dorsal; pectorals inserted just behind operculum. Scales moderately large, about 120 rows at lateral line. Lateral line straight.

Colour varies with age. Small parr have 8–11 pigmented bars along each side alternating with a single row of red spots along the lateral line. These markings are lost when the smolt stage is reached and the fish become silvery. Salmon in the sea are silvery on the sides and belly, the back varies through shades of brown, green, and blue. There are numerous black spots, usually X-shaped, scattered along the body, more numerous above the lateral line than below it; a few similar black spots on the head. Pectoral and caudal fins become blackish. When spawning both sexes take on an overall bronze-purple colouration and may acquire reddish spots on the head and body. After spawning the kelts are very dark in colour—hence the name "black salmon," although landlocked salmon in Newfoundland are also called "black salmon."

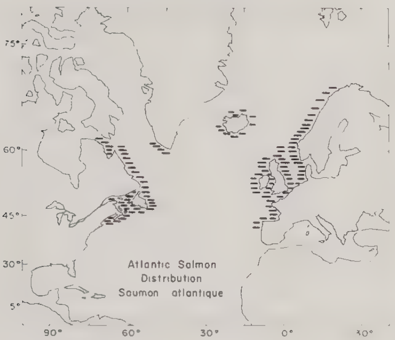
DISTINCTIONS: The Atlantic salmon may be distinguished from the light-spotted chars (brook trout and arctic char) by the black spots, larger scales, and teeth on the shaft of the vomer; from the rainbow trout by the absence of serial rows of black spots on caudal fin and from the brown trout by the shorter maxillary on the salmon, narrower peduncle, lack of red on adipose, and larger scales (see Key).

Species of introduced Pacific salmon, genus *Oncorhynchus*, are readily distinguished by the larger number of anal fin rays, 12–19, while the Atlantic salmon has 8–11 anal fin rays.

SIZE: Up to about 60 pounds in weight, but rarely over 30 pounds. Sea-run salmon commonly range from 3 to 20 pounds. The average size of commercially caught salmon is about 10 pounds. Rod-caught salmon comprise grilse up to about 5 pounds and older fish of 6 pounds and up.



RANGE: On both sides of the North Atlantic. On the western side it ranges from Ungava Bay,[124] the coast of Labrador, a few rivers on the west coast of Greenland, southward to the Connecticut River and formerly to the Hudson River. On the European coast it occurs from beyond the Arctic Circle to Portugal. It is landlocked in lakes in Quebec, New Brunswick, Nova Scotia, Newfoundland, and Maine, and formerly in Ontario. Introduced into Ontario, New York State, and on the Pacific coast of North America.



Canadian distribution: From Cape Hopes Advance, Ungava Bay,[125] eastward down the Labrador coast, most abundant commercially from Hamilton Inlet southward in the coastal waters of Newfoundland, Quebec, and the Maritime Provinces. Excellent angling in many rivers, some of the most notable being the Cascapedia, Restigouche, Miramichi, Margaree, St. Mary's, Medway, Saint John, Exploits, Humber, and Harrys rivers; landlocked in several lakes such as Lake St. John, Quebec; Grand Lake, Nova Scotia; and numerous Newfoundland lakes. Originally native to Lake Ontario but has been extinct there since 1890. Occasionally reported from the offshore banks, such as LaHave Bank and Sable Island Bank.

BIOLOGY AND ECONOMICS: The anadromous Atlantic salmon hatches in rapid freshwater rivers, where it commonly spends 3 years as a parr; as a smolt it descends to sea in May or June (landlocked forms go to lakes). While in the sea considerable movements may be undertaken covering several hundred miles. Smolts, marked by fin-clipping in the Petitcodiac and Miramichi rivers, have been recaptured in some numbers, on the east coast, and to a lesser extent on the west coast, of Newfoundland and Labrador.[243] Also, smolts tagged in the Miramichi River have been caught as grilse in commercial nets off western Greenland.[244] Kelts, tagged in the Annapolis and Margaree rivers, Nova Scotia, have also migrated to eastern Newfoundland. Large salmon, tagged off Port aux Basques, Newfoundland, have been caught in the Miramichi and Restigouche rivers and in rivers on the north shore of the Gulf of St. Lawrence.[38] Similarly, salmon tagged on the east coast of Newfoundland have gone to rivers in the Maritime Provinces as well as to Newfoundland rivers.[56] Recent tagging in southern Labrador shows them spreading in both directions towards Hamilton Inlet and the Strait of Belle Isle.[57] Marking and tagging indicates that most mature salmon return to the river which they left as smolts and there is evidence that most salmon enter only fresh waters of their natal stream.

Salmon spawn in freshwater streams, resorting there from the sea or, in the case of landlocked ones, from lakes. The spawning grounds may be a short distance from the sea or may involve a migration of 200–300 miles as, for example, the spawning in the Tobique branch of the Saint John River. The most successful spawning occurs in rapid, gravelly reaches although it may occur under a variety of conditions of water flow and bottom type (e.g. they do not spawn in still water with mud or sand bottom).

Atlantic salmon spawn in October and November. Some may enter fresh water in spring or early summer as so-called "early run" fish, such as in the Restigouche or some branches of the Miramichi; many may enter the same or other streams in late summer or early autumn, these being called "late run" fish.

As spawning time nears, the males undergo changes in the form of the head and a pronounced hook develops on the lower jaw and the head elongates. The spawning fish pair off over gravel beds in the streams. The female, using her caudal fin like a fan, excavates a depression (the "redd") in the gravel in which the eggs are deposited, fertilized, and covered. Female salmon produce about 800 eggs per pound of body weight. The eggs are spherical, about ¼ inch in diameter and are pale-orange or amber in colour. The time required for the eggs to hatch varies with the temperature but is about 110 days at 39 F. Under the fluctuating temperatures in the redd they usually hatch in April and emerge from the gravel in May or June of the year following egg deposition. The newly hatched salmon (about 0.6 inch long), which are called "alevins," carry a large yolk sac which is gradually used up before they emerge from the redd. Atlantic salmon often do not die after spawning but may return to the sea as kelts either the same fall or the following spring. They may spawn more than once.

Growth of the parr in the streams is slow and when these fish go to sea as smolts, usually at 2 or 3 years of age, they are from 5 to 7 inches in length. Growth in the sea is rapid and when some of them return to fresh water as "grilse," after approximately a year at sea, they may weigh from 3 to 6 pounds. Salmon that have been 2 years at sea weigh from 6 to 15 pounds. Few salmon live to be more than 9 years old. Landlocked salmon grow more slowly and make little additional growth after the first spawning.

Special names are applied to the salmon to distinguish the various growth stages. Newly hatched young are called "alevins," after emergence from the gravel they are called "underyearlings" or "fingerlings"; older young salmon are called "parr" (because of parr marks on side) and may remain in streams as parr for 2–4 years until eventually going to sea as silvery "smolts." Returning salmon are called "grilse" after one winter at sea or just "salmon" if they have had 2 years or more at sea.

Young parr feed mainly on the small larvae of the aquatic insects; older parr on larger insect larvae such as mayflies, stoneflies, etc., and they also eat a few aquatic annelids and molluscs. Smolt and larger salmon in the sea are voracious feeders, taking fishes and crustaceans chiefly. They eat herring, lance, alewives, smelt, capelin, small mackerel, small haddock, and others; the crustaceans eaten include euphausiids, amphipods, and some decapods.

Grilse and large salmon eat little if at all while on the spawning migration, despite their being caught by anglers using artificial flies or other bait.

While in fresh water the young may be eaten by eels and other predaceous fishes and by fish-eating birds, such as mergansers and to a lesser extent kingfishers. In the sea, salmon have been found in the stomachs of pollock, tuna, swordfish, and sharks. Salmon caught in nets are eaten by seals but there is no evidence that seals feed on salmon that are free-swimming.

Salmon contribute to the income of commercial fishermen and are valuable as a sport fish. Statistics indicate recent commercial salmon catches in the Atlantic provinces at 400,000 fish annually.

The commercial catch for 1962 was 3,703,000 pounds with a value of $1,601,000. At least 75,000 more fish are taken by sport fishermen. The commercial landings of Atlantic salmon in 1960 in eastern Canada according to Fisheries Statistics of Canada, 1960, were:

Province	*Landing in pounds*	*Value*
Prince Edward Island	—	—
Nova Scotia	240,000	$ 131,900
New Brunswick	616,000	365,900
Quebec	632,000	322,400
Newfoundland	2,089,000	640,900
Total	3,577,000	$1,461,100

The angling catch varies considerably from year to year and in the Maritime Provinces (exclusive of Quebec and Newfoundland), the annual yield to anglers ranges from about 25,000 to 50,000 fish. In Newfoundland the annual yield to anglers ranged from about 17,000 to 33,000 fish over the period from 1958 to 1963.

Brown trout

Truite brune

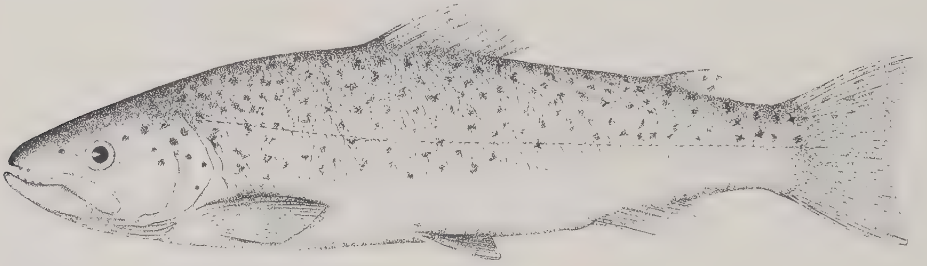
Salmo trutta Linnaeus 1758

DESCRIPTION: Body elongate but stout, greatest depth 4⅓ in total length, occurring at origin of dorsal fin, little compressed; caudal peduncle stout. Head 4½ in total length, somewhat compressed, snout blunt, mouth terminal, angle under posterior edge of eye, well-developed teeth on head and shaft of vomer, none on back of tongue. Eye 6 in head. Fins: dorsal (1), about 11; 3rd ray longest, about 2 in head, subsequent rays gradually shorter, base 1½ in head, located about middle of back, second fin adipose, situated on beginning of caudal peduncle; caudal large, truncate; anal, about 9, higher than dorsal whose base it equals, posterior edge of fin under adipose; pectorals moderate, length 1½ in head, base low on sides behind gill opening; pelvics abdominal, subtriangular, 1⅘ in head, bases on ventral edge under middle of first dorsal. Lateral line well developed, straight. Scales small.

Colour, brown to golden-brown on the dorsal surface; silvery on the sides; small black spots and crosses on back and top of head; larger black spots below the lateral line and on the gill covers, each sometimes surrounded by a light halo.[82] These halos may be absent in anadromous individuals.[75] The dorsal and adipose fins are normally black-spotted but, although occasional spotting may be vaguely visible on the caudal fin, this never occurs in the distinct serial arrangement so characteristic of the rainbow trout.

DISTINCTIONS: The brown trout is distinguished from the other salmonoids of this region, i.e. rainbow trout and Atlantic salmon, by the virtual absence of caudal spotting (so apparent in the rainbow) and from the Atlantic salmon by the long maxillary bone which extends beyond the eye, the smaller and more numerous black spots on the head, red colouration on adipose, and the smaller scales (see Key for further distinction).

SIZE: In Newfoundland, fish caught by angling average 5–6 pounds and fish weighing 28 pounds have been reported in recent years.



RANGE: The natural range extends from the northern coast of Europe southward around the British Isles to the Mediterranean basin as a nonmigratory form, and into the Black and Caspian Sea drainages. The brown trout has been introduced widely into many parts of the world, including North America and New Zealand.

Canadian distribution: Brown trout occur, through introduction, in every Canadian province except Prince Edward Island. Successful introductions occur in New Brunswick in the Mispec and Little river systems, St. John County and in the Didgeguash River, Charlotte County. In Nova Scotia they have survived in the Guysborough and Salmon rivers, in Clam Harbour River, in the Merigomish area, Kejimkujik Lake, Lower Mersey River, Salmon River (Yarmouth County), Cornwallis River and Harrison Lake. They are definitely anadromous in the Guysborough River, specimens up to 13 pounds in weight have been caught in Guysborough Harbour. They have spread, through the sea, to neighbouring rivers in this area.[75, 425, 532] Sea-run populations have become established on the Avalon Peninsula, Newfoundland, particularly on the Placentia Bay side. These Avalon Peninsula populations are possibly the largest available anywhere on this continent.

Arctic char **Omble arctique**

Salvelinus alpinus (Linnaeus) 1758

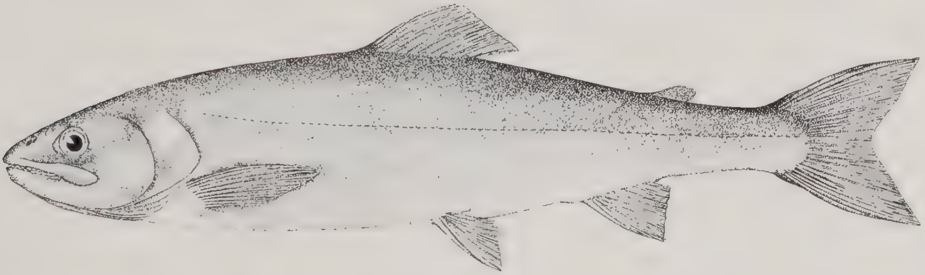
OTHER COMMON NAMES: sea trout, Hudson Bay salmon, ekaluk (eqaluk)

DESCRIPTION: Body elongate, moderately compressed. Head moderate, 4½ in length, elongate; mouth terminal, maxillary extending a little beyond orbit; vomer boat-shaped with teeth on head of bone only; teeth moderate on jaw, palatines, and tongue. Eye large. Fins: dorsal (1), 12–16, inserted about midway between snout and caudal peduncle; adipose small, inserted above posterior part of anal; caudal large, distinctly forked; anal, 11–15; pelvics, 9–11; pectorals, 12–15, inserted just behind gill openings. Scales small, about 200 rows at lateral line.

Colour, while in the sea, back metallic-blue, sides and belly silvery; red, pink or cream-coloured spots of varying sizes on flanks. In freshwater lakes the char may be generally silvery with light spots and lacking the intense blue colouration so characteristic of sea-run forms. However, as spawning time approaches, the red spots intensify, the lower portion of the sides becomes suffused with orange or orange-red, the colour of males being more intense than females, and lower fins suffused with red and orange-red. Young char have 11–13 parr marks on sides.

DISTINCTIONS: The arctic char may be distinguished from the brook trout by its distinctly forked tail and by the lack of marbling on the back. The tail of the brook trout is truncate or square and distinctly marked with vertical bars. Especially useful in identification is the lack of pigmentation on the dorsal and caudal fin of the arctic char in contrast to the marked pigmented patterns of these fins in the brook trout. Its red spots are plain, while those of the brook trout have a blue border.

SIZE: Arctic char are known to reach a length of 38 inches and a weight of 26 pounds, but fish weighing over 10 pounds are unusual.



RANGE: The range of the arctic char is circumpolar in the northern hemisphere and, although frequently sea-run, it occurs widely in fresh water where it may be landlocked. It is found throughout northern North America, Greenland, Iceland, Spitzbergen, Novaya Zemlya, Bear Island, northern Norway and northern Siberia. Landlocked, it occurs farther south than the sea-run variety, reaching New Brunswick and northern New England, the British Isles, the Alps, and USSR. (The forms known as *S. aureolus*, *S. marstoni*, and *S. oquassa* are here considered to be *S. alpinus* derivatives.)

Canadian distribution: The arctic char is widespread through the Canadian arctic islands and mainland; Herschel Island, Prince Patrick Island, Melville Island, Victoria Island, and Somerset Island, in the Northwest Territories; anadromous in streams entering the west side of Hudson Bay as far south as Churchill River; Ellesmere Island, Southampton Island, Frobisher Bay, Baffin Island, Resolution Island, Nottingham Island, Wakeham Bay; Ungava Bay (Chimo, Port Burwell, and George River); abundant along the Labrador coast north of Hamilton Inlet, less abundant south to Blanc Sablon and Matamek, Quebec; landlocked in many lakes in Quebec and Newfoundland and in Walton and Upsalquitch lakes, New Brunswick. For a recent view of Canadian studies and distribution, see McPhail.[4, 318a, 427, 508]

BIOLOGY AND ECONOMICS: Arctic char, unless landlocked, run to sea after several years of early life in fresh water. In Frobisher Bay they first run to sea at 6 years old.[175] They leave the rivers in spring when the ice breaks up and apparently remain close to shore, not being caught more than 25 miles from their native streams.[449] The return to fresh water begins in late July and continues through August; there is no evidence that any remain in the sea during winter. While in the streams their migration is stopped by very low obstructions although they can hold their position in swift water.

Spawning takes place in September and October when the fish resort to gravelly spots, in 6–16 feet of water, in lakes and deep pools in the rivers. Sea-run arctic char do not mature until 6 years old but the landlocked fish are mature at 2 years. Females deposit 2700–7000 eggs depending on size. The eggs are spherical, slightly under $\frac{1}{5}$ inch in diameter. There is evidence that mature females only spawn on alternate years.[175]

In general sea-run arctic char grow more rapidly than landlocked char. The growth rate varies widely in different areas. On the west coast of Hudson Bay the sea-run variety reaches a length of over 20 inches in 10 years, while the landlocked ones are only a little over 12 inches long at this age.[449] However, sea-run char at Frobisher Bay were only 13 inches long at 10 years and 25 inches at 20 years. Some char in this locality are believed to be 24 years old.[175]

The chief food of the sea-run arctic char consists of small fishes and Crustacea. Their diet includes sand lance (*Ammodytes americanus*), sculpins (*Triglops* sp., and *Myoxocephalus groenlandicus*), arctic cod (*Boreogadus saida*), young of their own species, amphipods, mysids, euphausiids, decapod larvae, and arrow worms. Landlocked char are known to eat sticklebacks and the pea clam (*Sphaerium*).

Arctic char are used as food by the Eskimo and their dogs. On the Labrador coast, between Hopedale and Hebron, they are salted in barrels; the average production there in the period 1944–1954 was 126,000 pounds annually, valued at $17,000. The commercial importance of char has increased greatly in recent years and they are in wide demand as a gourmet item. They are caught by means of gill nets, traps, and spears.

Brook trout — Omble de fontaine

Salvelinus fontinalis (Mitchill) 1815

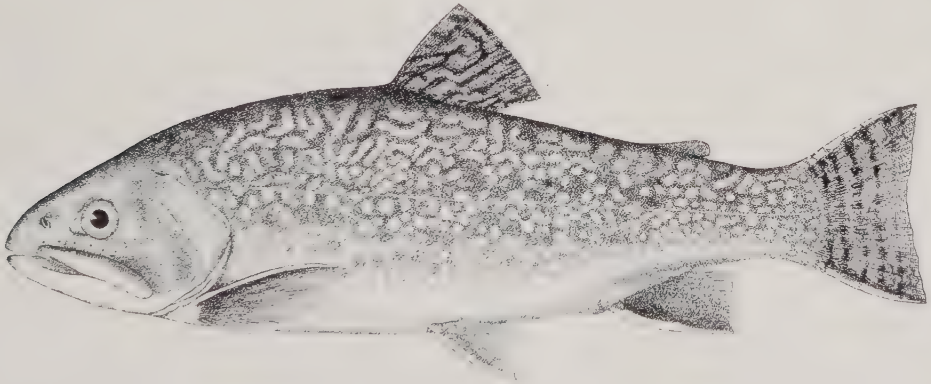
OTHER COMMON NAMES: speckled trout, sea trout, coaster, truite de mer, truite mouchetée

DESCRIPTION: Body elongate; moderately compressed. Head large, $4\frac{1}{2}$ in length, elongate; mouth terminal, large; maxillary reaching to behind posterior margin of eye; vomer boat-shaped with teeth on head of bone only; teeth on jaws, palatines, and tongue. Eye large. Fins: dorsal (1), 11–13, rarely 10 and 14, inserted about midway between snout and caudal peduncle; adipose small, inserted above posterior part of anal; caudal large, slightly lunate in adults, forked in young; anal, large, 9–12, rarely 13; pelvics abdominal, inserted below posterior portion of dorsal; pectorals just behind gill openings. Lateral line curved downwards at beginning, then straight. Scales small, about 230 rows at lateral line.

Colour strikingly different in sea trout and those in fresh water, except that in some waters sea-run fish go through a transition before leaving and after returning to fresh water. Trout living in salt water are steel-blue or green on the back, with cheeks and sides silvery (like salmon), belly white; pectoral, pelvic, and anal fins usually white or gray, tinged with pink, dorsal fin grayish-green, mottled with gray; each side with 8 or 9 very pale-orange spots. When sea trout enter fresh water they gradually lose the guanin and assume the colours of their freshwater relatives. Dark-green vermiculate markings appear on the back and on the dorsal fin; orange to red spots surrounded by blue borders appear on the sides. There is much colour variation depending on habitat; males are more highly coloured than females. Young brook trout exhibit 8–10 parr marks on the sides.

DISTINCTIONS: The brook trout may be distinguished from the arctic char by its almost square tail, that of the arctic char being forked; and by the presence of pigmented patterns on dorsal and caudal fins, while those of the arctic char are without any pattern. It differs from the Atlantic salmon in having a larger mouth, smaller scales, and lacking black spots and teeth on the shaft of the vomer.

SIZE: Sea-run brook trout may grow to 7 pounds or more but 3 pounds is large in the Maritime Provinces. The maximum size of 14½ pounds was recorded for a fish caught in the Nipigon River, Ontario.



RANGE: The brook trout is native only to eastern North America, attaining its greatest abundance in the maritime areas such as the Hudson Bay watersheds of Manitoba, Ontario, and Quebec, and the Atlantic coastal streams and inland waters of Quebec, Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, and northern New England.

Canadian distribution: Nelson River, western Hudson Bay;[538] James Bay;[496] rivers on eastern side of Hudson Bay and Ungava Bay;[124, 269] lakes and rivers of Labrador;[269] the eastern Canadian mainland generally, including Newfoundland and westward to Ontario. Sea-run trout occur in

Ungava Bay;[124] on the Labrador coast;[451] Newfoundland;[427] shores of Gulf of St. Lawrence, outer coast of Nova Scotia and sparingly in the Bay of Fundy.

BIOLOGY AND ECONOMICS: Throughout its eastern Canadian range the brook trout moves from most coastal streams into salt water. Such movements occur in the southern Gulf of St. Lawrence area, along the eastern Atlantic seaboard of Nova Scotia, and on a reduced scale in the Bay of Fundy region.

The staff of the Fisheries Research Board of Canada have studied intensively the movements of the brook trout and have shown that in general the fish is a freshwater form that may go to sea when stream conditions, such as rising temperature, become unfavourable. Movements of fish in spring and early summer were into areas of more favourable temperature. Crowding or competition for living space has also been shown to be an influential factor. Most movement has been shown to occur at night. Although much random movement takes place, most seaward movement occurs in the spring and early summer and in some areas there is a strong spawning movement to fresh water culminating in spawning in October or November.

When in the sea, brook trout seem usually to remain within the general influence of the stream or river of descent, although considerable random movement in the estuarial region may occur.

Brook trout spawn in gravelly areas in brooks and streams in October and November. The eggs are spherical, large (⅙ inch diameter), and female trout produce about 1300 eggs per pound of fish weight. The eggs are deposited and fertilized in nests or "redds" in the gravel. They develop there during the winter; after hatching, the young fish, with yolk sac attached, work their way out of the gravel. Incubation time depends on water temperature; it is about 85 days at 40 F and about 210 days at 33 F.

Brook trout grow at different rates in different localities and in general sea trout grow more rapidly than those that stay always in fresh water. Sea-run trout reach a length of 7½–9 inches in their second year, 10½–12½ inches in their fourth year, and 12–15 inches in their fifth year; fresh water trout reach 6½–7 inches in their second year, 9½–10 inches in their fourth, and about 12½ inches in their fifth year.[442b, 530]

While in fresh water trout feed on the larvae of chironomids, caddis flies, mayflies, dragonflies, stoneflies, and on snails; they also feed on adult insects at the surface. In salt water they eat fishes such as smelt, silversides, mummichogs, small eels, small sea ravens, rock eels, and also *Nereis*, amphipods, and isopods.[525]

Brook trout are eaten in fresh water by predaceous fishes, such as eels, white and yellow perch, and chain pickerel; by fish-eating birds such as mergansers and kingfishers and by some mammals, like the otter and mink. Sea-run trout often become infested by external crustacean parasites of the genera *Argulus* and *Lepeophtheirus*; these organisms may occasionally contribute to the death of trout.

The brook trout is valuable as a sport fish, being much sought after by anglers. Its sale is prohibited in the Maritime Provinces except under permit and no estimate of the total catch can be given. In the Province of Quebec some sale of trout is permitted; 25,000 pounds were reported sold in 1953 but this must be a small part of the total catch.

Family OSMERIDAE Smelts

The smelts are small marine fishes, sometimes anadromous as in the case of the American smelt, but more often living entirely in salt water. These silvery fishes are distributed around the northern hemisphere in the Atlantic, Arctic, and Pacific waters, often occurring in great abundance. Unlike the salmon and trouts they do not have a pelvic axillary process, but the slender body is covered with small cycloid scales, the lateral line usually well developed and an adipose fin is present. Males often develop nuptial tubercles.

Two species occur in the Canadian Atlantic area.

KEY to Family OSMERIDAE

Well-developed fang-like teeth on jaws and especially on tongue; never with longitudinal ridges along sides . American smelt, *Osmerus mordax* (p. 119)

Teeth on jaws and tongue weak; spawning males with well-developed ridges along each side .... Capelin, *Mallotus villosus* (p. 117)

Capelin Capelan

Mallotus villosus (Müller) 1777

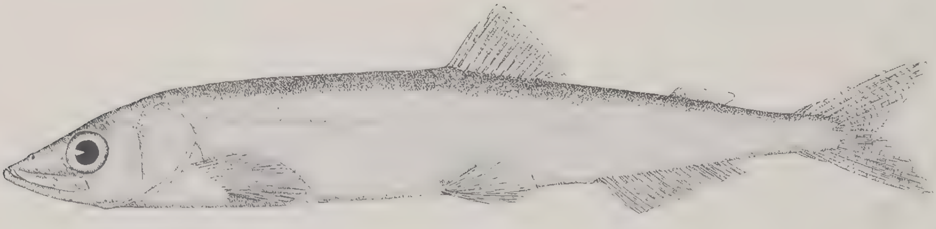
OTHER COMMON NAMES: caplin (in Newfoundland), lodde

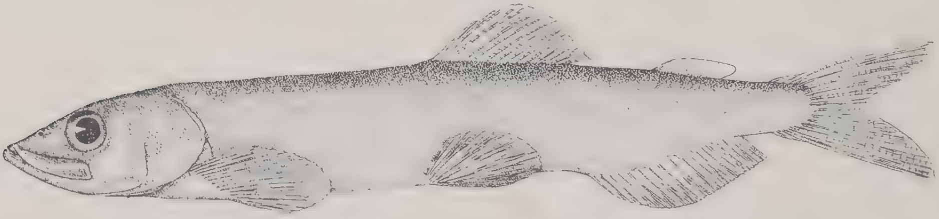
DESCRIPTION: Body elongate, compressed, nearly uniform in depth from operculum to anal fin. Head about 4½ in length, pointed; mouth terminal, lower jaw projecting considerably, maxillary ends under front half of eye; minute teeth on jaws, tongue, and on roof of mouth. Eye large, 4 in head. Fins: dorsal (1), 12–15, about as high as long, inserted about midway between snout and tip of tail; adipose low, long, its base 3 times its height; caudal forked; anal, 18–22, low, its base longer than that of dorsal, base elevated on a hump in males; pelvics abdominal, inserted below dorsal; pectorals just behind gill opening, broadly based, elongated in males. Scales small, about 200 per row on side, in males, one row of scales above the lateral line and another row on each side of the belly, longer than the other scales and even more pronounced at spawning time when they form four ridges on the body.

Colour, transparent-olive to bottle-green above, sides silvery below the lateral line, scale margins dotted with minute dusky specks; belly white.

DISTINCTIONS: The capelin may be distinguished from the smelt by the absence of fang-like teeth on the tongue, by the longer adipose fin, by the projecting lower jaw, by the smaller scales and, in spawning males, by the two ridges on either side of the body. The position of the dorsal fin over the pelvics distinguishes it from the argentine. It is easily distinguished from the silverside, which is sometimes mistakenly called "capelin." The silverside has two dorsal fins—a spinous and a soft-rayed one, and no adipose fin.

Size: Up to 9 inches in length.[461]





Range: Coronation Gulf; James, Hudson, and Ungava bays and south to the Gulf of St. Lawrence and Newfoundland. Scarce in Bay of Fundy and along Maine coast. East and west coasts of Greenland; Iceland; White Sea, Spitzbergen, and northern Norway.

Canadian distribution: Herschel Island, N.W.T., Coronation Gulf, James Bay, Hudson Bay (vicinity of Fort Churchill), Ungava Bay, the Labrador coast, becoming abundant from Cape Harrison south; Newfoundland, Anticosti, north shore of the Gulf of St. Lawrence to the mouth of the Saguenay River, Gaspé; becoming less abundant over the Magdalen Shallows; occurs irregularly in the Bay of Fundy (from King's County, Nova Scotia, to Passamaquoddy Bay) and very rarely on the coast of Maine. Found on the Grand Bank.

Biology and Economics: The capelin is a fish of the high seas coming inshore to spawn. Capelin spawn on coarse sand or fine gravel beaches as well as in depths up to 25 fathoms or more. Large quantities of capelin spawn just where the waves break over the beach, some fish being stranded in the process. Spawning occurs during June and July and occasionally in late August and takes place chiefly at night when the water temperatures are from 40 to 47 F.[461] The fish are sometimes paired in the spawning act; more frequently they are in groups of three, two males and one female. The eggs are spherical, $\frac{1}{25}$ inch in diameter and are adhesive; the larger females produce up to 50,000 eggs. After spawning, the eggs may be mixed with gravel to a depth of several inches. The eggs hatch in about 2 weeks at 50 F. The capelin spawns more than once; there is evidence that some females spawn in 3 consecutive years.[461]

Following hatching in July or August capelin larvae reach a length of from 1 to 1½ inches by the first winter. They average 3½ inches long when a year old. The largest fish are 3, 4, and 5 years old. Males are slightly larger than females of the same age.[461] Capelin in Greenland grow more slowly and fish 7 years old are known.[186]

The food of small capelin consists almost entirely of copepods. Larger ones eat amphipods, euphausiids, decapods, shrimp, and their larvae as well. While on the spawning grounds they eat the eggs of their own species. Spawning males are more inclined to feed than are spawning females.

Capelin are eaten extensively by cod, which is probably their chief predator. They are also eaten by salmon, dogfish, seals, whales, and many sea birds, including gulls and terns. Many other fishes, such as flounders, sculpins, and ellpout eat capelin to some extent. Herring sometimes eat large numbers of small capelin.[461]

Perhaps the chief importance of the species is in providing food for cod and other commercial species. They are used as human food, as bait in cod fishing, as food for dogs, and also as fertilizer and in the manufacture of fish meal. Newfoundland landings in 1953 were 32 million pounds; slightly less than 1 million pounds were landed in the Province of Quebec. The catch of capelin from the Canadian Atlantic area for 1962 was 9,864,000 pounds, with a value of $80,000.[70b]

American smelt — Éperlan d'Amérique

Osmerus mordax (Mitchill) 1815

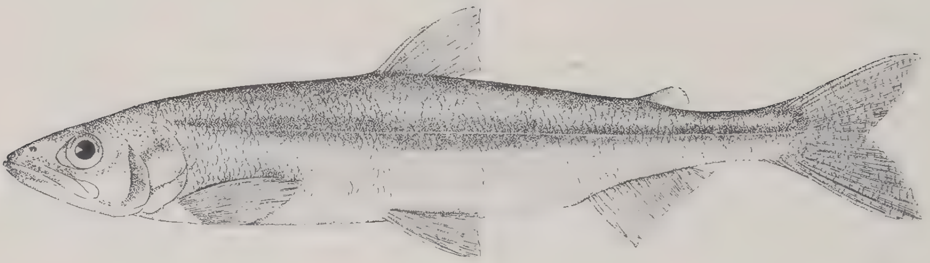
OTHER COMMON NAMES: smelt

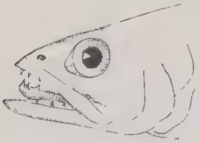
DESCRIPTION: Body slender, compressed, greatest depth in front of dorsal fin, tapering thence toward head and tail. Head about 5 in length, pointed; mouth terminal, lower jaw projecting slightly, fine teeth on jaws, a few strong fang-like teeth on tongue, largest at tip; teeth on vomer. Eye about 5 in head, above posterior part of mouth. Fins: dorsal (1), 9–11, inserted about middle of back, higher than long; adipose small, fleshy, over posterior part of anal; caudal deeply forked; anal, 15–18, longer than high; pelvics abdominal, under anterior part of dorsal; pectorals inserted immediately behind gill opening. Scales large, about 75 in each row on sides, easily removed. Lateral line straight, incomplete.

Colour, transparent-olive to bottle-green above; sides paler with a broad longitudinal silvery band; belly silvery; fins and body flecked with tiny dusky dots.

DISTINCTIONS: The presence of the adipose fin distinguishes the smelt from the herring and allied species. It is distinguished from the capelin by its larger scales, by its short, flap-like adipose fin, clearly free of the body, and by the larger teeth on the tongue. In the smelt the mouth gapes behind the eye, whereas in the capelin only to about the middle of the eye. It is distinguished from the argentine by the position of the dorsal fin, in the smelt directly above the pelvics, whereas in the argentine the dorsal is distinctly in front of the pelvics. In the silverside (often confused with small smelt) the mouth is very small, a black "pencil-line" extends along the side above the definite silvery band, the large second dorsal fin is over the middle of the large anal fin and the first dorsal fin is small, possesses spines, and is often concealed in the groove in the back in live specimens.

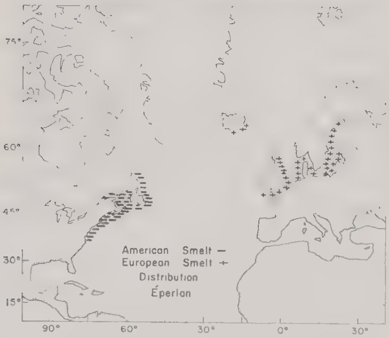
SIZE: Up to 12 inches in length.





RANGE: The smelt, an inshore species, extends along the North American coast of the Atlantic from the Hamilton Inlet–Lake Melville area, which is reported to be the northernmost limit of range,[25, 269] to as far south as Virginia. It is occasionally landlocked in lakes in Newfoundland, New Brunswick, Nova Scotia, Quebec, and Maine. From its introduction into Lake Michigan and elsewhere, it has spread into the Great Lakes.

The North American and European smelt are here considered as two distinct species,[224] the form occurring on the European coast being known as *O. eperlanus*. In a recent publication McAllister suggests the two species are synonymous.[291c] The range of *O. eperlanus* extends from the Seine northward through the North Sea, and in the Baltic northward into the Gulf of Bothnia. It is not found on the western coast of Norway but has been found at Iceland, Greenland, and Svalbard, Spitzbergen.



Canadian distribution: An anadromous fish, it occurs in coastal waters and in streams of southern Labrador, Newfoundland, the north shore of the Gulf of St. Lawrence, and Anticosti; occurs sparingly at the Magdalen Islands, Chaleur Bay, abundant in Miramichi Bay and River; coast of Nova Scotia and Bay of Fundy. Landlocked in Lake St. John and Lake Champlain, Quebec; in Grand Lake, Nova Scotia; in Lake Utopia and associated lakes in New Brunswick and in Newfoundland lakes. As a result of introduction smelt have spread throughout the Great Lakes and many inland lakes of Ontario. They are abundant in Lake Erie where in 1961 the Canadian commercial production was of the order of 13,000,000 pounds.

BIOLOGY AND ECONOMICS: Smelt live in coastal waters, ascending streams to spawn. Little is known of their migrations in the sea. One smelt, tagged at Portage

Island in Miramichi Bay was caught 100 miles distant in the upper Chaleur Bay, but this is exceptional. Smelt of all sizes enter estuaries in the autumn months and may be caught there during the winter. There is evidence in the Miramichi estuary that successive schools come in from deeper water throughout the late winter months.

This species spawns in brooks and streams above the head of tide and sometimes below the head of tide, particularly if obstructions bar further progress. In the Miramichi River the earliest spawning, in late April, occurs in the main branches of the river while later spawners choose small tributaries of the main river, most of which branch from the tidal portion of it. Spawning continues through May and into June, covering about 2 months in all. Most spawning occurs at night. Female smelt produce from 7000 to 60,000 eggs, depending on the size of the fish. The eggs are spherical, about 1/20 inch in diameter, heavier than fresh water, and adhesive. They become attached to rocks, gravel, vegetation, and to each other. Sometimes the bottoms of brooks are covered with thick carpets of eggs, with as many as 180,000 per square foot. Under such conditions heavy mortalities occur. The eggs hatch in 8–10 days at 68 F, in 16–21 days at 53 F, and in 51–63 days at 39 F. The resultant fry are carried down to brackish water soon after hatching and are to be found there after early May. Years with light rainfall during the spawning period are most favourable for the production of smelt fry.

Fry which hatch early grow to a length of 2½ inches by November. Subsequent growth is rapid, so that 2-year-old smelt, that are mature, are large enough for commercial use. Two- and 3-year-old smelt, 5–8 inches long, make up the bulk of the commercial catch. A few 4- and 5-year-old fish are caught.

Smelt fry eat copepods and other planktonic forms. As the smelt become larger their food consists of amphipods, euphausiids, mysids, shrimp, marine worms (*Nereis*), and any small fishes that are available such as herring, mummichogs, and silversides.

Smelt are eaten by cod, salmon, and other large fishes; by seals, cormorants, and mergansers.

The smelt fishery is of importance, particularly in the Gulf of St. Lawrence section of New Brunswick, where a large fishery exists in the Miramichi estuary. The fish are chiefly caught through the ice in box nets. Elsewhere bag nets and gill nets are employed in the smelt fishery. They afford some sport fishing with hook and line wherever they occur.

The catch of smelt from the Canadian Atlantic area for 1962 was 2,578,000 pounds, with a value of $236,000.[70b]

Family ARGENTINIDAE — Argentines

The argentines are marine deep-water relatives of the smelts and are worldwide in distribution. Some members of the family occur in the deeper waters over the continental slope while others are bathypelagic. In the argentines the pelvic fins are located behind the dorsal fin, the mouth is small and equipped with weak teeth and the scales are large and deciduous. This group of fishes has been thoroughly reviewed by Cohen.[83]

Three species occur in Canadian Atlantic waters.

KEY to Family ARGENTINIDAE

1 Branchiostegals 3 or 4 .... Large-eyed argentine, *Nansenia groenlandica* (p. 123)
Branchiostegals 5 or 6 2

2 Gill rakers on lower arm of first arch 13 (range 11–15); branchiostegals 6; scales usually with spines; air bladder silvery .... Atlantic argentine, *Argentina silus* (p. 122)
Gill rakers on lower arm of first arch 6 (range 5–10); branchiostegals 5; scales without spines; air bladder not silvery .... Striated argentine, *Argentina striata* (p. 123)

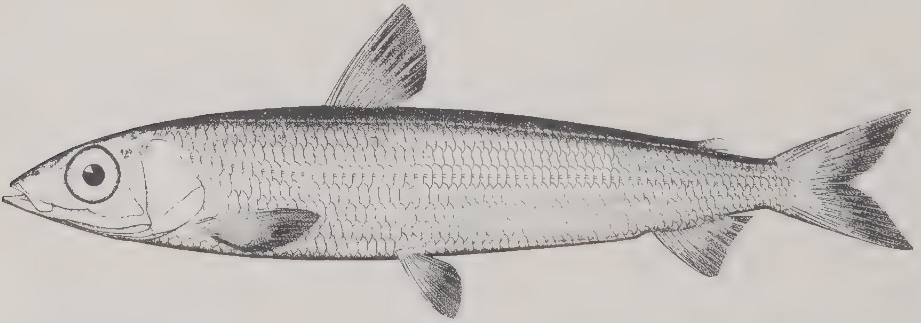
Atlantic argentine **Grande argentine**

Argentina silus Ascanius 1763

OTHER COMMON NAMES: herring smelt

DESCRIPTION: Body slender, compressed. Head pointed, 4⅛ in body; mouth terminal, small, not gaping as far as eye; very small teeth on tongue and roof of mouth, none on jaws. Eye large, 3½ in head. Fins: dorsal (1), 12, short but high, inserted midway between snout and adipose fin; adipose present, small; caudal deeply forked; anal, 13, inserted below adipose; pelvics abdominal, inserted behind dorsal; pectorals inserted just behind gill opening. Scales large, 60–66 rows on side; a median row along the back and belly.

Colour, brown to olive, sides silvery with a golden to brassy lustre. Belly white. Adipose fin yellowish.



DISTINCTIONS: The argentine may be distinguished from the smelt and the capelin by the position of the dorsal fin in front of the pelvics instead of over them; its jaws lack the teeth which are present in the smelt; the eye is larger and the mouth smaller than the smelt and capelin. The presence of an adipose fin distinguishes it from the herring.

Size: Up to 18 inches in length.

Range: Both sides of the North Atlantic in deep water, 30 fathoms or more. From Banquereau and southern Grand Bank to Georges Bank. Northern Norway to the northern North Sea.

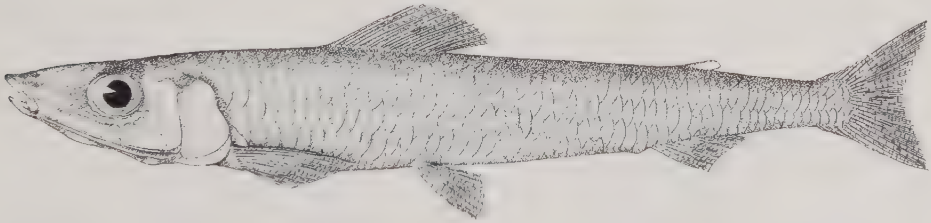
Canadian distribution: Southern edge of Grand Bank and northeastern Banquereau;[18, 313] off Cape Sable, in 200 fathoms;[313] southwest of Emerald Bank where several hundred were trawled in March 1938.[304]

Biology and Economics: The argentine is a deep-water fish which is being caught more frequently with the increase in otter trawling at suitable depths. Its eggs are spherical, ⅛ inch in diameter, with a large oil globule. They are buoyant but float at intermediate depths, only rarely at the surface. The species is not commercially utilized at the present time.

Striated argentine **Argentine striée**

Argentina striata Goode and Bean 1896

The occurrence of this species in Canadian Atlantic waters was reported by Schroeder[414] as a result of exploratory trawling along the continental shelf between Nova Scotia and Virginia. The species was caught off Nova Scotia in the area designated as "area A-long 63°17′ to 65°59′ W, from the offing of southeastern Nova Scotia to the eastern slope of Georges Bank." Schroeder indicated that the species was taken southward to Virginia, in depths less than 200 fathoms.



No further occurrences have been reported in our area but it is quite possible that the species is taken occasionally by commercial fishing but not distinguished from the common species, *A. silus.*

Large-eyed argentine **Serpe du Groenland**

Nansenia groenlandica (Reinhardt) 1839

Description: Body elongate, cylindrical; depth 10 in length. Head small, 5 in length; mouth terminal, small; a narrow series of fine teeth on the lower jaw and vomer. Eye very large, nearly ½ length of head. Fins: dorsal (1), 11, situated about midway between snout and base of caudal, moderately high, longest rays slightly less than length of head; adipose small, disappearing in adults; caudal forked; anal 10, slightly in front of adipose, about ½ size of dorsal; pectorals inserted just behind gill opening; pelvics abdominal, under posterior part of dorsal. Scales thin, silvery.

Colour silvery.

DISTINCTIONS: The large eye and slender form distinguish this fish from the argentine, capelin, and smelt, that also have adipose fins. The large-eyed argentine has only 3–4 branchiostegal rays as compared to 6–8 in the argentine.

SIZE: The largest specimen recorded was 9½ inches long.

RANGE: Taken infrequently. Known from Greenland and off the European coast between Iceland and the British Isles and west of English Channel; one record in the western Atlantic.

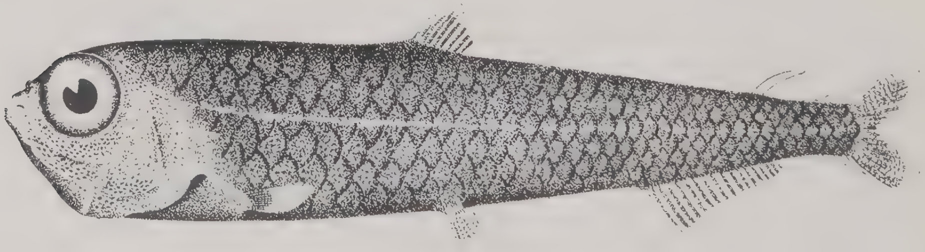
Canadian distribution: A 9½-inch specimen (the largest known) was taken from the stomach of a black swallower (*Chiasmodon niger*) that was caught south of Browns Bank at lat 39°10′N, long 69°40′W on September 23, 1932.[498]

Family BATHYLAGIDAE Blacksmelts

Goitre blacksmelt **Garcette-goître**

Bathylagus euryops Goode and Bean 1895*

DESCRIPTION: Body oblong, compressed, greatest depth about 5 in total length, occurring just behind eye, body tapers uniformly from there to tail where depth is about 17 in total length. Head short, about 5 in total length, compressed, snout blunt with upper and lower profiles steep, meeting at approximately right angles at the mouth which is terminal and small, angle in front of eye, lower jaw projecting, rudimentary teeth in upper jaw, those in lower jaw very small, forming a fine serrature on edge of bone, a series of minute teeth on vomer and palatines. Eye very large, about 3.7 in head, located high on head. Fins: dorsal (1), 9, located on back about midway between snout and caudal peduncle, middle rays longest and equal to eye diameter, length of base equals eye diameter; adipose length equals eye diameter and is located over posterior part of anal; caudal moderate, forked; anal 19, first 2 rays short, 3rd longest, its length slightly exceeding eye diameter, remaining rays gradually shorter, length of base 1¼ in head length, located well back on body, terminating a little behind adipose; pectorals moderate,



Bathylagus benedicti is a synonym.

longest rays 3 in head, located low on side, about the fin's own length behind gill opening; pelvics wider than pectorals and about same length, located ventrally under posterior part of dorsal. Lateral line straight, on middle of side. Body covered with large scales, that detach easily; about 7 horizontal rows between base of dorsal and base of pelvics.

Colour, dark; no luminous organs.

DISTINCTIONS: This species differs from the lanternfishes, which it resembles in body shape, by the absence of luminous organs, in having much lower dorsal and anal fins, the former with fewer rays (not over 9). It differs from the argentine in having the greatest depth immediately behind the eye, whereas the argentine is deepest under the dorsal fin; its snout is very blunt, whereas that of the argentine is pointed.

SIZE: Up to a length of 5¾ inches.[170]

RANGE: In deep water. On the east coast of North America off southern Labrador, northern Newfoundland, the southern edge of the Grand Bank, and farther south off Georges Bank and off Long Island. The northern records are in depths up to 410 fathoms, while those off the New England States are in 1022–1769 fathoms.

Canadian distribution: Reports of this species have been limited to deep waters off Labrador and Newfoundland. In October 1953, one specimen was taken at lat 50°25′N, long 50°37′W in 384 fathoms off the northeast coast of Newfoundland. In September 1954, two specimens were taken at lat 54°20′N, long 53°50′W in 400 fathoms, east of southern Labrador.[9] In June 1956, three specimens were taken along the southern edge of the Grand Bank at lat 42°58′N, long 50°44′W and at lat 43°10′N, long 51°12′W in 300–380 fathoms.

Suborder STOMIATOIDEA—STOMIATOID FISHES

The stomiatids are bathypelagic or midwater deep-sea fishes, widely distributed through the world's oceans, and related to the Clupeoidea and Salmonoidea. Because of the inaccessibility of the regions they inhabit, knowledge of the suborder is incomplete. One interesting feature, however, is that many species have larval forms that differ greatly in appearance from the adults.

Stomiatids differ from clupeids and salmonids in possessing luminous organs or photophores (and also the swim bladder has no connection with the gut). These luminous organs are usually arranged in two rows, one long and low following the ventral outline of the body from head to tail, the second immediately above it and half as long, extending posteriorly from the head. Some luminous spots may occur elsewhere on the body. Some species possess adipose fins like salmonids, others have the dorsal fin located posteriorly. The mouth is terminal, often well armed with long teeth, and the gape is usually wide. Many species are dark or black in colour.

Canadian Atlantic Stomiatoidea are classified here in eight families, Gonostomatidae, Sternoptychidae, Stomiatidae, Melanostomiatidae, Idiacanthidae, Astronesthidae, Chauliodontidae, and Malacosteidae. This arrangement is employed for convenience since our knowledge of the stomiatoid fishes occurring in Canadian waters is meagre, especially the family Astronesthidae which is not treated. Specimens of stomiatoid-like fishes that are caught during commercial fishing should be sent to a Biological Station of the Fisheries Research Board of Canada so that they may be studied and correctly identified.

KEY to Families of Suborder STOMIATOIDEA

1 Rigid keel, either plate-like or reduced and paired, in front of dorsal fin; body deep and strongly compressed; gape nearly vertical .... Silver hatchetfishes, family Sternoptychidae (p. 130)

Without rigid keel in front of dorsal fin; body elongate; gape more or less horizontal 2

2 Gill rakers present; no barbel .... Anglemouths, family Gonostomatidae (p. 127)

Gill rakers absent, the arches naked or with teeth only; elongate fishes often with barbel under jaw 3

3 Dorsal fin origin far forward, its origin one head length behind head; teeth long, needle-like, lower canines overlapping upper jaw and extending to or above eye; no hyoid or chin barbel .... Viperfishes, family Chauliodontidae (p. 136)

Dorsal fin origin far behind head, 3 or more times the head length; teeth more or less well developed but without bizarre development of lower canines; hyoid barbel usually present (except in Malacosteidae) 4

4 Hyoid or chin barbel absent; no floor in mouth, instead lower jaw connected to hyoid arch by a cord-like strand of tissue; skin without scales or scale-like markings .... Loosejaws, family Malacosteidae (p. 137)

Hyoid or chin barbel usually present; lower jaw with a floor connecting jaw and hyoid arch 5

5 Body with scales or scale-like pattern; dorsal fin origin behind anal fin origin and both located far back, behind pelvic fin origin .... Scaled dragonfishes, family Stomiatidae (p. 133)

Body without scales or scale-like markings; dorsal fin origin may be far back behind pelvic fins, or over pelvic fins, or slightly in advance of pelvic fins 6

6 Pectoral fins absent; dorsal fin long, its origin in advance of pelvic fins and body midpoint .... Sawtailfishes, family Idiacanthidae (p. 135)

Pectoral fins present; dorsal fin short 7

7 Dorsal fin not far back, but in body midpoint position, located over pelvic fins and distinctly in advance of anal fin .... Bighead dragonfishes, family Astronesthidae

Dorsal fin far back, its origin behind pelvic fins; dorsal fin located over anal fin, both fins more or less on caudal peduncle .... Smooth dragonfishes, family Melanostomiatidae (p. 134)

Family GONOSTOMATIDAE Anglemouths

KEY to Family GONOSTOMATIDAE

1 Photophores large and obvious and more or less arranged in groups; mouth small .... Müller's pearlsides, *Maurolicus muelleri* (p. 129)

Photophores on body in continuous longitudinal rows; mouth large 2

2 Well-developed but slender teeth in a continuous series along border of upper jaw, on premaxillary and maxillary; anal rays 21–31 .... Longtooth anglemouth, *Gonostoma elongatum* (p. 128)

Teeth few in front (absent on premaxillary) increasing in size posteriorly; anal rays 16–20 (*Cyclothone* sp.) 3

3 Dark brown in colour ... Veiled anglemouth, *Cyclothone microdon* (p. 127)

Light in colour with dark speckles .... Brauer's anglemouth, *Cyclothone braueri* (p. 127)

Brauer's anglemouth Cyclothone de Brauer

Cyclothone braueri Jesperson and Tåning 1926

Bigelow and Schroeder[49] report a specimen, 23 mm long, taken on Browns Bank, from 30 fathoms, June 24, 1915, and another possibly of this species from the Fundy Deep, from 90 fathoms, on March 22, 1920.

The lack of material renders a comparative description unfeasible.

Veiled anglemouth Cyclothone jaune

Cyclothone microdon (Günther) 1878

DESCRIPTION: Body elongate, somewhat compressed, deepest at gill opening, depth almost 8 in length. Head moderately high, conical, $4\frac{2}{3}$ in length; mouth terminal, lower jaw projecting slightly; mouth very large, extending much beyond posterior margin of eye, about $\frac{3}{4}$ length of head; each jaw armed with over 100 small teeth, those on the maxillary pointing forward. Eye small, 12 in head, interorbital space narrow. Fins: dorsal (1), 12–13, inserted nearer to caudal than to snout; caudal deeply forked; anal, 19, longer than dorsal, originates very slightly behind dorsal, about same height as dorsal; pelvics abdominal, small; pectorals just behind gill opening. Gill openings very long. A ventral row of small luminous spots extends on each side from isthmus to base of caudal; it consists of 31–35 photophores; above it is a shorter row beginning above the base of the pectoral, of 7–11 photophores, extending to the beginning of the anal. One photophore below eye; two on gill cover and nine on gill membranes.

Colour, brownish-black. Photophores with black rims.

DISTINCTIONS: Veiled anglemouth is distinguished from the lanternfishes by the absence of an adipose fin and from *Stomias* by its much heavier body and by the absence of a barbel on the lower jaw.

SIZE: Up to 3 inches in length.

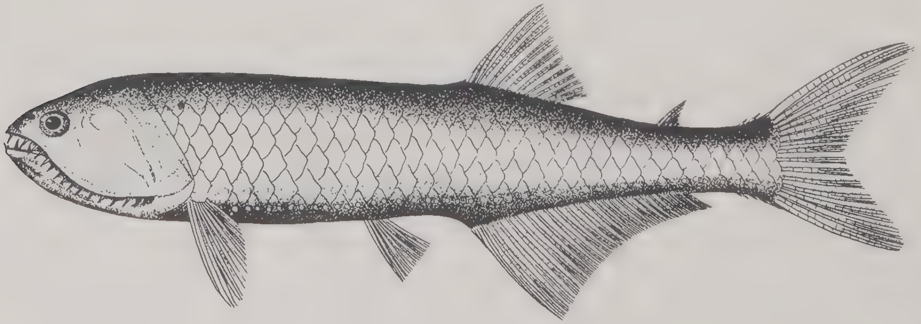
RANGE: Reported from 500 to 2900 fathoms in the Atlantic near Bermuda and from the Laurentian Channel, Gulf of St. Lawrence and off Nova Scotia. In the Pacific from southern California to northwestern Alaska.

Canadian distribution: Two specimens, one 2¼ inches long, were caught in 110 fathoms off Fox River, Quebec, in 1954.[454] Two specimens, reportedly taken off Cape Sable, Nova Scotia, are in the U.S. National Museum (USNM no. 85464). Dannevig[102] reported five specimens of *Cyclothone* sp., 7–16 mm long, collected off mouth of Laurentian Channel at lat 42°53′N, long 54°09′W.

Longtooth anglemouth **Gonostome à grandes dents**

Gonostoma elongatum Günther 1878

DESCRIPTION: Body elongate, somewhat compressed, greatest depth 6 in total length, occurring at level of pectoral fin, depth decreasing posteriorly, caudal peduncle very stout. Head 4⅔ in total length, compressed, profiles rounded, snout blunt; mouth terminal, large, angle behind eye, upper jaw armed with about 14 long, slender, sharp teeth, the spaces between them occupied with very small teeth, the lower jaw with 10–11 large teeth, similarly spaced by smaller ones, vomer without teeth; cheek covered by a very large infraorbital plate with spines or teeth on its free margin. Eye small, 7 in head, situated well forward on head. Fins: dorsal (1), 14–15, first 3 or 4 rays graduated, 4th the longest being 2 in head, subsequent rays shorter, the last 7 in head, base of fin 2 in head, beginning a little behind midpoint of body; adipose height 7 in head, located midway between posterior end of dorsal and beginning of caudal; caudal moderately large, forked; anal (1) 30–31, first rays ⅔ length of head, subsequent ones gradually shorter until last rays are 7 in head, base slightly longer than the head, its beginning directly under the origin of the first dorsal; pectorals moderate, end rounded, longest rays ⅗ length of head, base low on side, just behind gill opening; pelvics smaller, end truncate, longest rays about ⅓ head length, located ventrally nearer to anal fin than to pectorals. Body covered with large, thin scales, easily detached. A row of luminous spots along lower portion of sides from base of pectorals to tail. Lateral line not apparent.



DISTINCTIONS: This fish resembles the lanternfishes and the viperfish in having a row of luminous spots low on each side and in having an adipose fin. The large teeth in the mouth and the absence of luminous spots higher on the sides distinguish it from the lanternfishes. It is much stouter than the viperfish, the dorsal is much farther back and lacks any particularly long rays, such as the viperfish has. It has a much longer anal fin than the viperfish. The teeth in the jaws are smaller also.

SIZE: Small fishes, attaining lengths of about 6 inches.

RANGE: Found on both sides of the North Atlantic Ocean. On the western side it occurs south of Newfoundland; and off the New England coast in depths up to 260 fathoms.

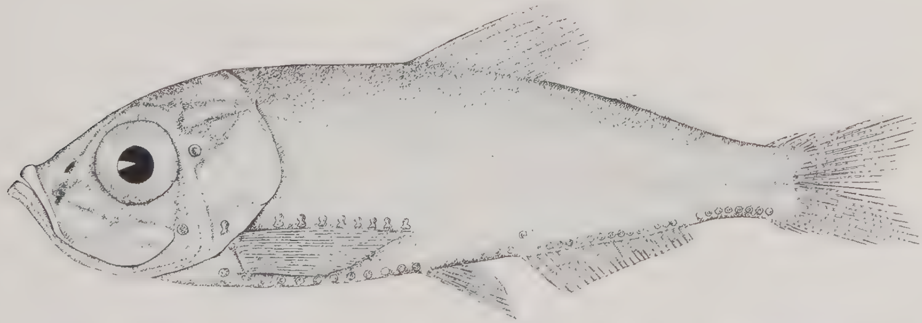
Canadian distribution: A single specimen has been trawled on the southwestern edge of the Grand Bank at lat 44°08′N, long 52°50′W. It was caught in March 1951 by the M. V. *Blue Spray* in 83–100 fathoms.[6]

Müller's pearlsides — Maurolique de Müller

Maurolicus muelleri (Gmelin) 1788

DESCRIPTION: Body oblong, compressed, greatest depth just behind head, 5 in length. Head large, compressed, 3½ in length, mouth oblique, lower jaw projecting, mouth small, not opening as far back as front margin of eye; maxillary with small teeth. Eye large, 3 in head, about midway between snout and gill opening. Fins: dorsal (1), 11–12, higher than long, located over space between pelvics and anal, and nearer to base of caudal than to snout; adipose low and long; caudal broad, only slightly forked; anal, 28–30, long, originating just behind line drawn vertically through posterior end of dorsal; pectorals immediately behind gill opening, midway between lateral line and ventral midline of body; pelvics abdominal inserted low on body. Scales large, thin, easily removed. Lateral line indistinct. Luminous spots appear as impressions on skin; 12 pairs along belly between pectoral and pelvics, 5–6 between pelvics and anal, then a gap followed by 24–25 spots ending near base of caudal; a second row of larger spots above these extending from base of pectorals to above base of pelvics; 6 small, luminous spots on sides of isthmus; 1 spot in front of base of each pectoral; one before eye and 2 behind it.

Colour, dark-bluish or greenish on back, sides and belly silvery-white. Luminescent spots black rimmed, centres pale-blue. A narrow black band along base of anal, extending to base of caudal.



DISTINCTIONS: The pearlsides is distinguished from the headlight fish by the absence of a luminous patch on the snout; and from the lanternfishes by the different arrangement of the luminous spots. It is further distinguished from these species by its colour, by the posterior position of the dorsal fin, and by the small mouth.

SIZE: Up to 2½ inches in length.

RANGE: Widely distributed in the open Atlantic. Common on the coasts of Great Britain and Norway. Found sparingly from the Bay of Fundy to Cape Cod and Woods Hole on the western side of the Atlantic.

Canadian distribution: Grand Manan.[93, 358] From pollock stomach and also on beach at Campobello, New Brunswick, in July 1914.[205]

BIOLOGY AND ECONOMICS: This fish is frequently eaten in Europe by cod and herring and has been found in pollock stomachs in Canada; it probably lives at moderate depths.

Family STERNOPTYCHIDAE Silver hatchetfishes

This family of peculiarly shaped marine fishes is distinguished by the presence of a rigid keel or blade-like structure located in front of the dorsal fin.

These are deep-sea fishes ranging through tropical and temperate seas and descending at least to depths of over 12,000 feet in the Atlantic Ocean. For further information see Schultz.[417]

KEY to Family STERNOPTYCHIDAE

1 Dorsal blade not conspicuous externally, visible only as a short, low (paired) keel in front of dorsal fin; photophores: abdominal 10, supra-abdominal 3, lateral 1 .... *Polyipnus asteroides**

Dorsal blade well developed and plainly visible externally 2

2 Dorsal keel or blade with well-defined, ray-like ridges; photophores: abdominal 12, supra-abdominal 6 .... Atlantic silver hatchetfish, *Argyropelecus aculeatus* (p. 130)

Dorsal keel or blade without ray-like ridges and terminating in an acute, backwardly directed tip; photophores: abdominal 10, supra-abdominal none .... Transparent hatchetfish, *Sternoptyx diaphana* (p. 132)

Atlantic silver hatchetfish Hache d'argent à épines

Argyropelecus aculeatus Cuvier and Valenciennes 1849

DESCRIPTION: Body short, very deep anteriorly, very much compressed, passing abruptly into the tail; a break in the dorsal and ventral contours about halfway between snout and tail; behind these contour breaks the depth of the body decreases rapidly; 2 short bony spurs, outgrowths of the pubic bones, at the ventral contour break. Head large, much compressed; mouth large, terminal, but directed upward so that upper jaw is almost vertical; minute teeth in jaws; a downward directed spine at angle of opercle. Eye large, 3 in head, placed high on head and directed upward; interorbital space small. Highest part of body surmounted by 7–8 neural processes increasing in height rearward and forming a hard triangular plate from the head to the break in the dorsal contour. Fins: dorsal (1), 9, soft-rayed, middle rays longest, located immediately behind neural processes, its origin at dorsal contour break; adipose low, with long base; caudal forked; 2 anals, 7–5, separated by a short space; pelvics, 6, abdominal, located behind break in ventral contour; pectorals, 10–11, inserted low on body.

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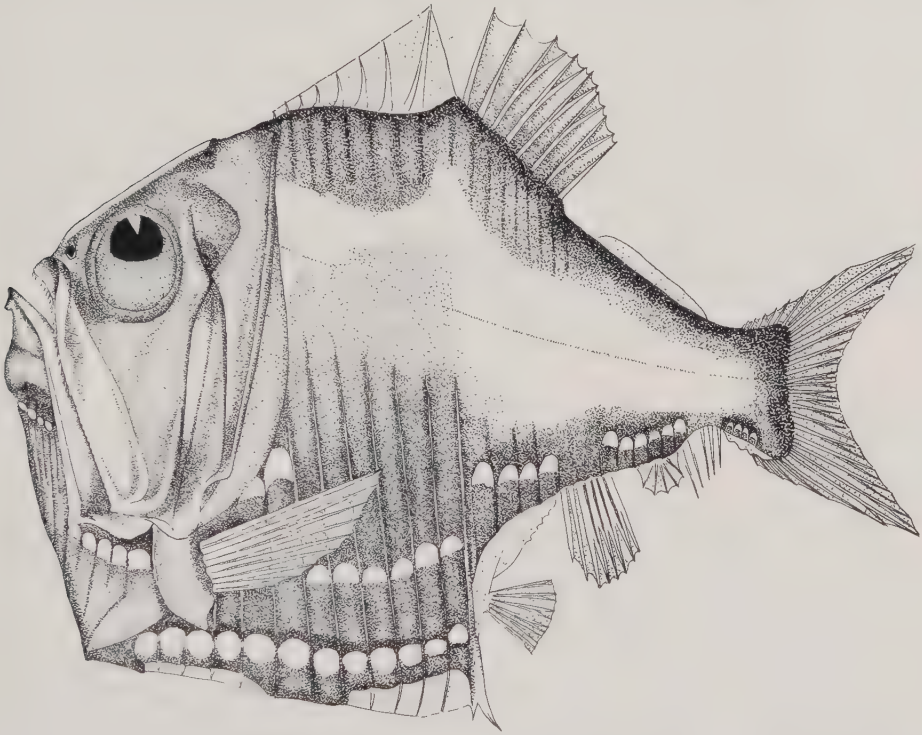
* Only recently reported in the Canadian region.



Skin without scales, except for a series of 12 hard plate-like scales or scutes from pectoral to pubic spurs. Profile saw-edged between pelvic and anal fins; double series of spines on lower edge of caudal peduncle. Gill opening very wide. Lower portion of body with many photophores; one in front of eye, one below and behind eye, 2 on lower part of gill cover, 5 small ones on either side of lower jaw; row of 12 low down on each side of deepest part of body, 6 in row between pectoral and pelvics, 6 in front of each pectoral, 2 above pectorals, 4 between pelvic and anal fins, 6 above anal, and 4 small ones between anal and caudal.

Colour, silvery over a dark substratum; photophores yellow with black edgings.

Distinctions: The silver hatchetfish can be distinguished by the deep, highly compressed body, the almost vertical jaws, the projecting neural processes, and pubic spurs and by the arrangement of the photophores.

Size: Up to a maximum length of about 3 inches.

Range: Oceanic in mid-depths, coming to surface at night. Reported from the

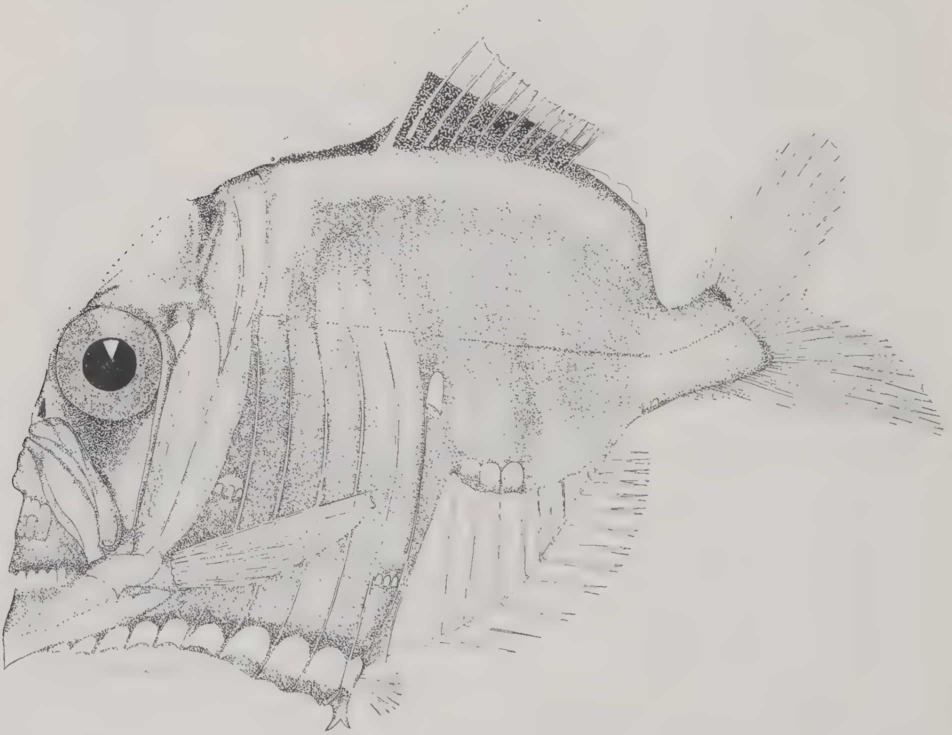
Grand Bank, Georges and Browns banks, and southward to the Gulf of Mexico and West Indies. In Europe as far north as Norway; occurs at Bay of Cadiz, the Canary Islands, and the Azores. Also in the Pacific and Indian oceans.

Canadian distribution: This species was recorded by Goode and Bean[170] as *Argyropelecus olfersii*, from Albatross station 2063 at "42°22′N. Lat., 66°23′W. Long., at a depth of 144 fathoms," a position between Georges and Browns banks. This record is probably the basis for Halkett's[184] report of *A. olfersii* from Canadian waters. Goode and Bean also noted that "A single specimen was obtained from the Grand Banks by a Gloucester fisherman."

Transparent hatchetfish **Hache d'argent diaphane**

Sternoptyx diaphana Hermann 1781

This species was listed by Halkett[184] and said to occur from "Grand Banks, Newfoundland, and southward to Santa Cruz Island. . ." Schultz[417] noted that the northermost record known to him was a collection taken near LaHave Bank, off Nova Scotia (lat 42°46′N, long 63°22′W). The specimens are in the collections of the Museum of Comparative Zoology (no. 37662).



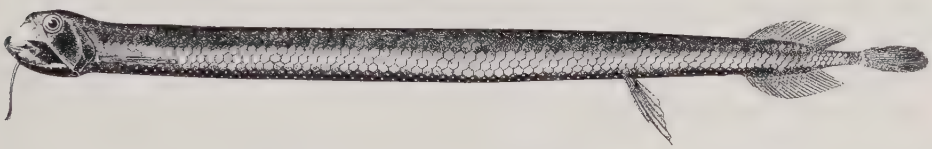
This species is said to be commonly taken at depths of 100–1000 fathoms, the deepest records in the Atlantic Ocean being 1686 fathoms. The largest Atlantic specimen measured 46.5 mm (1$\frac{5}{8}$ inches) from tip of snout to caudal fin base.

Family STOMIATIDAE Scaled dragonfishes

Boa dragonfish **Dragon-boa**

Stomias boa ferox Reinhardt 1842

DESCRIPTION: Body elongate, compressed, depth 12 in length; depth almost uniform from behind head to pelvics, thence tapering to tail. Head compressed, 10 in length; snout very short; mouth terminal but oblique, very large, extending beyond posterior margin of eye; large, pointed, and unequal teeth on the premaxillaries and mandibles; maxillaries and tongue with fine teeth; a pair of fangs on vomer; a large, fleshy barbel, equal in length to the head, on lower jaw. Gill openings wide. Eyes moderate, 5 in head. Fins: dorsal (1), 17, placed very far back on body, well behind pelvics; caudal small, tip rounded; anal, 21, under dorsal and slightly larger than it; pelvics, 6, much nearer caudal than head, moderate; pectorals immediately behind gill openings, slightly smaller than pelvics. Scales small, easily removed, scarcely overlapping, lying in roughly hexagonal depressions in the skin. Lower side of head, body, and tail with 2 rows of small photophores, about 85 in each ventral row and about 60 in each lateral row.



Colour, black both above and below; sides with a metallic iridescence.

DISTINCTIONS: This species can be distinguished from the viperfish by the absence of an adipose fin; by the location of the dorsal fin far back on the body, and by the barbel on the lower jaw.

SIZE: Up to 12 inches in length.

RANGE: Widespread in the North Atlantic from depths of 75–400 fathoms, occurring along the continental shelf between the southeastern slope of the Newfoundland Banks and the Bahama Channel. A species (*Stomioides nicholsi*) was described by Dr A. E. Parr[343] based on a specimen removed from the stomach of a swordfish, *Xiphias gladius*, harpooned 220 miles ESE of Thatcher's Island, SE peak of Browns Bank above 250 fathoms of water on August 3, 1932. The species is of doubtful validity. It may more properly be regarded as a synonym of *Stomias boa ferox*.

Canadian distribution: Twenty-four specimens, from 5 to 12 inches long, have been reported from the southeastern and extreme eastern portion of the Grand Bank. One specimen was caught in January 1951, at lat 42° 58′N, long 49° 55′W in 120–160 fathoms.[6] Four specimens were caught in 1953 at lat 43° 29′N, long 51° 34′W and lat 43° 41′N, long 52° 03′W.[8] Ten specimens were caught in June 1956, in 315–350 fathoms in this same general area. Nine others were caught in similar depths to the north of Flemish Cap in the vicinity of lat 48° 25′N, long

45° 00′W in the same year. A young specimen, slightly over 1 inch long, was caught in July 1915, southeast from Cape Sable, Nova Scotia, at lat 42° 36′N, long 64° 41′W.[102]

Family MELANOSTOMIATIDAE — Smooth dragonfishes

These are large-mouthed elongate fishes, usually but not always scaled, lacking an adipose fin and having the lower jaw connected by a membrane to the hyoid arch. Characteristically, a well-developed barbel is usually present on lower jaw.

KEY to Family MELANOSTOMIATIDAE

1 Vomer without teeth; a continuous luminous line on side extending from behind operculum to anal fin origin, in addition to 2 rows of photophores .... Torpedo dragonfish, *Grammatostomias dentatus* (p. 134)

Vomer toothed; no continuous luminous line on side in addition to photophores 2

2 Pectoral fins located near mid point of body; teeth mainly fixed, depressible anteriorly only; dorsal fin rays 18–20 .... Threelight dragonfish, *Trigonolampa miriceps* (p. 135)

Pectoral fins located in posterior half of body, near anal fin; teeth depressible; dorsal fin rays 12–15 .... Bluenose dragonfish, *Melanostomias spilorhynchus*

Torpedo dragonfish — Dragon-torpille

Grammatostomias dentatus Goode and Bean 1895

Description: Body compressed, moderately elongate; depth 7, tapering towards tail; caudal peduncle slender. Head short, compressed; mouth terminal, large, its length about equal to greatest depth of body; lower jaw with large fangs at tip, followed by 2 rows of somewhat smaller teeth, the outer row fixed, the inner row depressible; similar, but slightly shorter fangs and teeth towards the front of the upper jaw, the first pair fixed, the second pair movable; very fine teeth on maxillaries at back of upper jaw; a very long barbel on the lower jaw, approximately ⅓ total length of body. Eye small, 5 in head. Fins: dorsal (1), 20, located far back on body and extending almost to caudal peduncle, its middle rays longest and a little less than half the length of the base; caudal forked; anal, 24, located under dorsal but extending slightly farther back, about same size as dorsal; pelvics abdominal, inserted a little nearer to snout than to caudal peduncle; pectorals, 4, first ray distinct but not appreciably longer than others, inserted ventrally just behind gill opening. Body without scales. Two rows of luminous spots, one of about 30 close to ventral outline, extending from pectoral almost to origin of anal; a shorter row of about 18 spots above this on lower half of body, extending from gill opening to a point about midway on body.

Colour, generally dark, surface of body sprinkled with minute raised pigment spots each with a light centre. A pearl-coloured spot on each cheek behind eye. A series of pigment cells along median line of body, so arranged as to simulate a lateral line.

Distinctions: *Grammatostomias* may be distinguished from *Stomias* by its naked skin, *Stomias* having scales. The barbel is much longer than that of *Stomias*.

SIZE: The type specimen was 6½ inches long.

RANGE: The type specimen was taken east of Cape May, outside the continental shelf at lat 38°19′N, long 69°02′W in 2069 fathoms. There is also the doubtful Canadian record described below.

Canadian distribution: A specimen, doubtfully referred to this species, was caught on February 5, 1951, along the southwestern edge of the Grand Bank at lat 43°30′N, long 51°30′W in 148–155 fathoms. It differed from the type in having more photophores and the pelvic fins were placed posterior to the middle of the total length.

Threelight dragonfish — Dragon trois-lampes

Trigonolampa miriceps Regan and Trewavas 1930

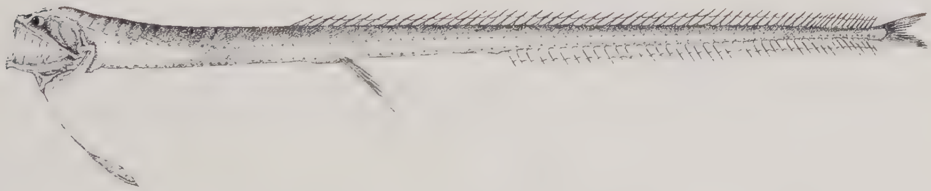
This species is rare in our area and is known only from about three specimens, two of which were taken from Georges Bank. One of these specimens was removed from the stomach of a swordfish, *Xiphias gladius*, harpooned on the southern edge of Georges Bank "in September, 1922, or prior to that date."[343]

Family IDIACANTHIDAE — Sawtailfishes

Ribbon sawtailfish — Idiacanthe ruban

Idiacanthus fasciola Peters 1876

DESCRIPTION: Body very elongate, greatest depth 19–27 in total length, occurring immediately behind head, tapering gradually to a short caudal peduncle that enlarges slightly at base of caudal fin. The following account applies to females since males are small, about 45mm, toothless, without barbel and brown in colour. Head 15–18 in total length, compressed, blunt, a long hyoid barbel on chin, this appendage 2½ times head length with 2 unequal, enlarged, terminal branches, lower jaw projecting slightly; mouth terminal, large, almost full length of head, both jaws with numerous, long, but unequal teeth, the length of several exceeding eye diameter, teeth on tongue and 2 on vomer, depressible. Eye 5–7 in head. Fins: dorsal (1) 54–74, rays widely spaced, except near tail, length of rays 4–5 in head, rather uniform, fin begins at end of first third of body and continues to caudal peduncle; caudal small, forked, lower lobe the longer; anal, 38–49, same height as dorsal, beginning under 19th or 20th ray of dorsal and continuing to caudal peduncle; pectoral fins absent; pelvics 6, situated ventrally under first to eighth dorsal rays, longest rays ¾ length of head. Body scaleless. No evident lateral line. Photophores in 2 rows on ventral half of body, extending from gill



opening to about 15th anal ray, then a single row to caudal peduncle; about 77–90 in lower row, 51–61 in upper row; a large photophore behind and below eye.

Colour, black.

Distinctions: This species may be recognized by its long, eel-like body, large teeth in the mouth, presence of a long barbel, long low dorsal fin, and the absence of pectoral fins.

Size: Up to a length of 16 inches.

Range: Recorded from various parts of the North Atlantic Ocean from mid-ocean to the Gulf of Mexico, in depths up to 2750 fathoms;[330, 378] also from the Pacific and Indian Oceans.[340, 378]

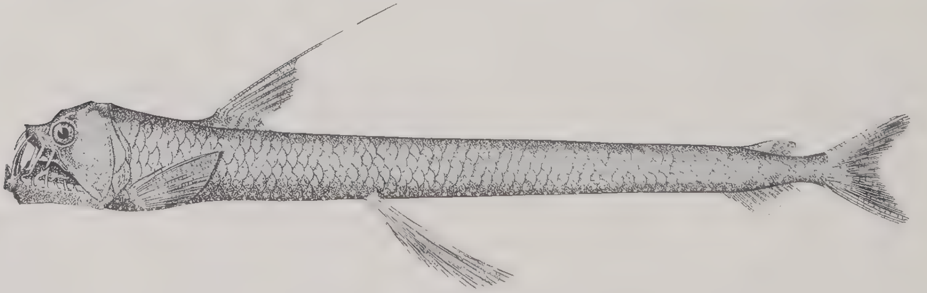
Canadian distribution: One specimen was trawled on the southwestern edge of the Grand Bank at lat 43°22′N, long 51°45′W, in 348 fathoms; it was caught by the *Investigator II* in June 1956.

Family CHAULIODONTIDAE — Viperfishes

Viperfish — **Chauliode de Sloane**

Chauliodus sloani Bloch and Schneider 1801

Description: Body very elongate, compressed, tapering from head to tail, greatest depth 7 in length. Head higher than body, compressed, 7 in length, lower jaw projecting; mouth large, extending well beyond eye; premaxillaries with 4 long, fang-like canines on each side; mandible with pointed, wide-set teeth, the front ones very long; further small teeth on maxillaries and in mouth; no teeth on tongue. Eye moderate, 5 in head. Fins: dorsal (1), 6–7, first ray very long, ending in filament almost ⅓ length of body, located far forward, short distance behind head; high; adipose small, above anal and only a short interval between it and base of caudal; caudal forked; anal, 12, low, located short distance in front of caudal; pectorals moderate, inserted short distance behind gill opening. Pelvics abdominal, a little longer than head, situated well behind dorsal, and about midway between snout and beginning of anal. Scales large, very thin, 56 rows on side. A series of luminous spots on lower side of head, body, and tail.



Colour, back greenish, sides silvery, belly blackish.

Distinctions: The viperfish is readily distinguished by its slender form, large head with prominent fangs in both jaws and the luminescent spots on the lower portion of the body. The anterior position of the dorsal fin and the presence of an adipose fin separate it from *Stomias boa ferox* and related forms, that lack an adipose fin and have the dorsal fin far back on the body.

SIZE: Up to a length of 12 inches.

RANGE: Mid-depths of the Atlantic and in the Mediterranean.

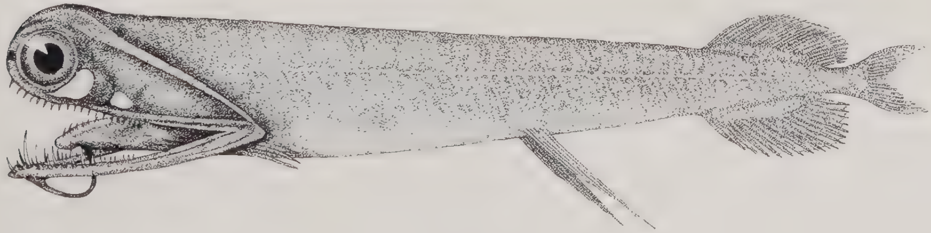
Canadian distribution: Known only from the Grand Bank area in depths of 250–396 fathoms. In 1951 and 1956 some 17 specimens, from 5½ to 10½ inches long, were reported. Most of these specimens were from the northeastern part of the Banks (lat 48°N, long 45°W) but 2 were from lat 43°22′N, long 51°45′W at the southwestern edge of the Banks and 2 were from an intermediate position (lat 45°05′N, long 48°55′W).[6] One 7⅓-inch specimen was caught, in May 1955, presumably from the Laurentian Channel near St. Pierre Bank.[10]

Family MALACOSTEIDAE — Loosejaws

Loosejaw **Drague à godet**

Malacosteus niger Ayres 1848

DESCRIPTION: Body elongate, compressed, greatest depth 8 in total length, occurring in region of gill opening, the body tapering uniformly behind this to beginning of dorsal fin, depth greater under dorsal fin; caudal peduncle small. Head 4 in total length, compressed, snout blunt, upper profile rounded; mouth very large, angle under base of pectoral fin, permitting a very wide gape, pointed, unequal teeth in a single series in both jaws, 4 or 5 in each jaw longer and fang-like, recurved teeth on tongue. Two luminous organs on each side of head, the larger crescent-shaped, the other smaller, almost circular, and a short distance behind the first. Eye large, 7 in head, far forward on head. Fins: dorsal (1), 19, triangular in shape, longest rays 2⅔ in head, these being the 12th or 13th rays, base of fin ⅔ as long as head, fin located far back on body—on the posterior third—and terminating on beginning of caudal peduncle; caudal small, lunate; anal, 20, same shape and a trifle larger than the dorsal, under which it is located; pectorals small, length 4 in head, base located immediately over middle of gill opening; pelvics longer, longest rays 2 in head, narrow, located ventrally, slightly posterior to middle of body. No scales.



Colour, black with numerous light dots over the entire body.

DISTINCTIONS: The large mouth, posterior position of the dorsal, and anal fins and the dark colour place this species with a group of deep-sea forms. *Malacosteus* differs from many of them, such as *Stomias*, in the absence of a barbel on the lower jaw. The insertion of the pectoral fins in front of the angle of the mouth distinguishes it from *Cyclothone*, which, like *Malacosteus*, lacks a barbel. Most distinctive is absence of membranous floor in mouth.

SIZE: Up to a length of 8½ inches.[170]

RANGE: In the western North Atlantic. Occurs east of Newfoundland, south of the tip of Grand Bank, off Long Island, New York, and at Barbados, in depths of 350–1060 fathoms.[170]

Canadian distribution: A single specimen, 5½ inches long, was trawled on July 14, 1956, north of Flemish Cap at lat 48°21′N, long 44°49′W in 350 fathoms.[11]

Order INIOMI (Myctophiformes, Scopeliformes)

This is a large and rather varied group of soft-rayed marine fishes, thought to have been derived from isospondylid fishes (herrings, salmon, etc.). Their distinctive characteristics are that the border of the upper jaw is formed by the premaxillary bone (in the salmonoid fishes this role is filled by the maxillary bone), the pelvic fins are abdominal or thoracic, pelvic bones are free from the cleithra, the air bladder is usually absent but when present is joined by a duct to the gut, and the adipose fin is usually present.

Many species are fragile, black or silvery-black in colour, and deep sea dwellers. These deep-sea forms are usually equipped with luminous spots or glands that give off light.

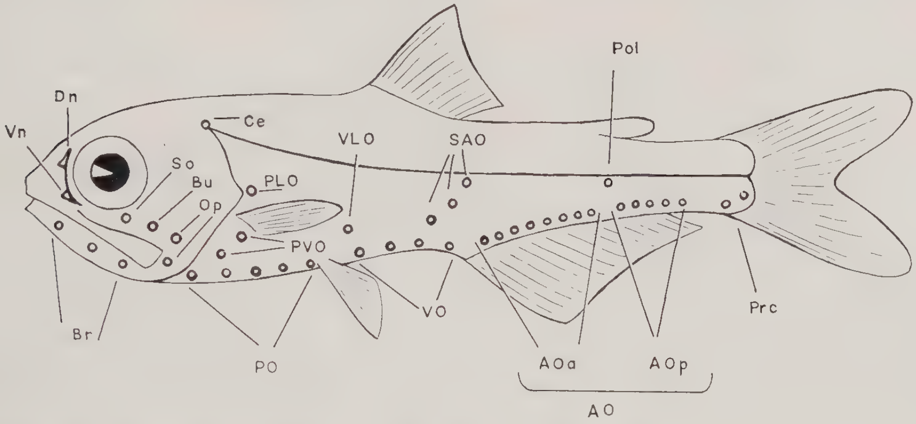
Included in this order are such forms as the lizardfishes, lanternfishes, and lancetfishes. The order is classified in two suborders, Myctophoidea and Ateleopoidea, but only the first suborder is represented in our area. In it are four families as follows: Myctophidae, Paralepididae (Sudidae), Alepisauridae, and Anotopteridae.

Family MYCTOPHIDAE — Lanternfishes

The lanternfishes are among the more attractive and fascinating of marine fishes because of the presence of numerous photophores or light organs on the head and body. The position and arrangement of these photophores follows a basic pattern and the variations in the arrangement are used to aid in the identification of the numerous species. An accompanying illustration is provided to illustrate the names used to designate the various photophores.

Although often regarded as deep sea fishes, in fact the lanternfishes occupy the upper layers of the ocean as opposed to the abyssal depths and are most frequently caught in depths ranging from 330 to 1650 feet (100–500 metres). They occupy this region in company with many other fishes that possess light organs such as stomiatid and hatchetfishes, and such crustaceans as prawns. The myctophids migrate upward at night, ascending into surface waters to feed during the hours of darkness and returning to the depths with the approach of dawn. This daily vertical movement is a response to light and, of course, it means that many of these fishes may be much more readily captured at night than during the day. It is of interest that many fishes that occur in deep waters in the warm central Atlantic live at shallower depths in the cooler waters of the Canadian Atlantic, particularly the northern parts of this region.

The lanternfishes are not, taxonomically speaking, a well-known group and this appears to be particularly true of the species that occur in Canadian Atlantic waters for few of the incidental collections that have been made have been thoroughly studied and very few reports have been published. In general the specimens that are available for study have been taken more or less incidentally, and in many cases in the form of stomach contents from cod and pollock. Fishes obtained from this latter source are often, naturally enough, in a rather battered state.



In view of our limited knowledge of the species occurring and the difficulties involved in identifying many of these, a definitive key to the species of myctophids has not been attempted. For further information see Parr;[341] Fraser-Brunner;[144b] Bolin.[62]

KEY to Subfamilies of MYCTOPHIDAE

A Anal fin commencing some distance behind insertion of last dorsal ray (only genus *Neoscopelus* possible) .... Subfamily Neoscopelinae

B Anal fin commencing below dorsal or close behind insertion of last dorsal ray .... Subfamily Myctophinae

KEY to Genera of Subfamily MYCTOPHINAE

1 Procurrent caudal rays soft, flexible and never bearing luminous tissue 2

Procurrent caudal rays stiff, spine-like, and may bear luminous tissue 14

2 AO in one continuous series; no distinct Pol ..... Genus *Hierops*
AO in 2 series; distinct Pol 3

3 Some photophores above lateral line area ..... Genus *Notolychnus*
No photophores above lateral line 4

4 Base of anal fin much longer than that of dorsal 5
Base of anal fin shorter or only slightly longer than that of dorsal 6

5 PLO distinctly higher than upper end of pectoral fin base 8
PLO not higher than upper end of pectoral fin base 12

6 Supra- or infra-caudal luminous glands present ..... Genus *Lobianchia*
Supra- or infra-caudal luminous glands not present 7

7 2Vn, the second appearing as a well defined rounded organ on lower orbital margin ..... Genus *Diaphus*
1Vn, greatly expanded, extending along the entire anterior orbital margin and part of the lower orbital margin ..... Genus *Aethoprora*

8 2 Pol ..... Genus *Hygophum*
1 Pol 9

9 PVO horizontal or nearly so, not forming a straight line with first PO 10
PVO oblique, forming straight line with first PO 11

10 2nd Prc elevated ..... Genus *Benthosema*
2nd Prc not elevated ..... Genus *Diogenichthys*

11 SAO strongly angulated ..... Genus *Symbolophorus*
SAO in a straight, or almost straight, oblique line ..... Genus *Myctophum*

12 Narrowest part of caudal peduncle greater than diameter of eye ..... Genus *Loweina*
Narrowest part of caudal peduncle less than diameter of eye 13

13 Lateral line distinct ..... Genus *Gonichthys*
No lateral line ..... Genus *Centrobranchus*

14 Photophore groups not distinct ..... Genus *Scopelopsis*
Photophore groups distinct 15

15 Single supra- and infra-caudal luminous glands present, heavily outlined with black pigment 16
No well defined, pigment-outlined supra- and infra-caudal glands 17

16 Pelvic fins inserted under dorsal fin origin ..... Genus *Lampadena*
Pelvic fins well in advance of dorsal fin origin ..... Genus *Taaningichthys*

17 Base of dorsal fin longer than that of anal .... Genus *Notoscopelus*
Base of dorsal fin not longer than that of anal 18

18 One or 2 strong teeth on each side of head of vomer ..... Genus *Ceratoscopelus*
A patch of small teeth on each side of head of vomer 19

19 Scale-like luminous glands at the bases of dorsal, anal and sometimes the pectoral and pelvic fins .... Genus *Lepidophanes*
No scale-like luminous glands at the bases of the dorsal, anal, pectoral or pelvic fins .... Genus *Lampanyctus*

Headlight fish **Lanterne de tête**

Aethoprora metopoclampa (Cocco) 1829

Description: Body elongate, moderately stout but somewhat compressed, depth 4 in length, caudal peduncle stout. Head moderately large, about 4 in length; anterior profile rounded; mouth terminal, maxillary extending well behind eye. Eye large, 2½ in head, close to snout. Fins: dorsal (1), 14–15, about as high as long; adipose small, about midway between posterior part of dorsal and base of caudal; caudal forked; anal, 13–16, its anterior edge under posterior part of dorsal; pelvics large, inserted under anterior portion of dorsal; pectorals small, inserted low behind gill opening, with tip of operculum extending above fin. Scales large, 35 or 36 in row along side. Lateral line pronounced, almost straight. A luminous patch covers the entire tip of the snout, including anterior margin of orbit and extends down over edge of upper jaw. About 26 photophores or luminescent spots on lower part of body, ending on caudal peduncle; 4 photophores on lower part of base of tail.

Colour, blackish-silvery; luminescent organs pale-blue or green.

Distinctions: The headlight fish is distinguished from the lanternfishes and pearlsides by the presence of the large luminescent patch on the snout and by the four distinct photophores on the base of the tail.

Size: Up to about 7 inches in length.

Range: Oceanic in northwestern Atlantic and Australian waters, rarely straying to the Banks off eastern North America.

Canadian distribution: There is a record of one specimen, 65 mm in length, taken from the stomach of a cod caught on the Western Banks, in February 1930, and reported by Vladykov[498] as *Aethoprora effulgens* Goode and Bean, 1895.

Glacier lanternfish **Lanterne glacière**

Benthosema glaciale (Reinhardt) 1837

Description: Body fusiform, somewhat compressed, depth 4–4¼ in length; caudal peduncle stout. Head 3½–4 in length, mouth terminal, snout blunt with steep upper profile; maxillary dilated at posterior end, reaching slightly beyond posterior margin of eye. Eye large, 2½ in head, situated near snout. Fins: dorsal (1), 12–15, inserted slightly nearer to snout than to origin of caudal fin; adipose fin moderate in size; caudal forked; anal, 16–20, longer than dorsal, originating under anterior half of dorsal; pelvics small, inserted under middle of pectoral, tip not reaching anal; pectorals larger, inserted behind operculum, midway between lateral line and ventral midline of body. Scales 33–36 in lateral line. Photophores: one postero-lateral organ; anal organs in 2 groups, 5–7, 5–9; second ventral organ displaced slightly dorsally; supra-ventral organ nearly equidistant from lateral line and base of ventral fin; first supra-anal organ nearly in a straight line between supra-ventral organ and second supra-anal organ; it is situated above second to third ventral organs. Ultimate pre-caudal organ near the lateral line; 2 photophores on lower base of caudal. When over 1 inch long, males have supra-caudal luminous plate and females an infra-caudal one.

DISTINCTIONS: This species may be distinguished from the headlight fish by the absence of a luminous patch on the snout. It is distinguished from the other lanternfish of this area by the detailed distribution of photophores. The slightly elevated position of the second ventral organ distinguishes it from *Symbolophorus* and *M. punctatum*. It is distinguished from *H. benoiti* by having one postero-lateral organ only; *H. benoiti* has two.

SIZE: Maximum length about 3½ inches.

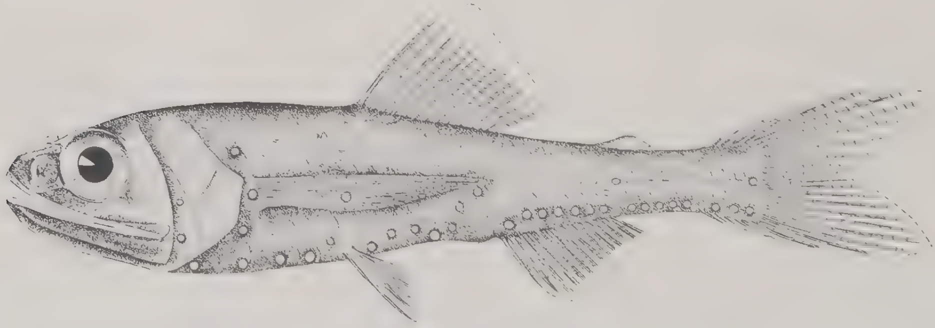
RANGE: Davis Strait to off Cape Hatteras. Jan Mayen and Spitzbergen to the Cape Verde Islands, and in the Mediterranean. Pelagic, usually in deep water.

Canadian distribution: Obtained from cod stomachs at Port Burwell, Ungava Bay, in 1947 and 1948, and one caught at the surface at Port Burwell Harbour;[124] Cabot Strait; 15 miles northwest of Miquelon; off Rose Blanche, Newfoundland; southwestern edge of Grand Bank.[17, 19, 20] A small specimen (less than 1 inch long) taken southwest of Cape Sable, Nova Scotia, outside the 200-fathom line.[102] Several taken July 13, 1953, in 300–340 fathoms at 43°41′N, 52°03′W, southern Grand Bank.[8]

BIOLOGY AND ECONOMICS: The normal habitat is the open sea where it occurs from the surface to over 200 fathoms. Occurrence at the surface is at night. It feeds on planktonic Crustacea. It spawns, when 2 years old, in spring and summer in northern waters. The eggs are pelagic.[230]

Horned lanternfish **Lanterne cornée**

Ceratoscopelus maderensis (Lowe) 1839



DISTINCTIONS: The long pectoral fins and the pronounced projecting spine over the eye assist in the identification of this species.

Canadian distribution: This species was reported by Halkett[184] as *C. madeirensis* and said to occur on "Grand Banks of Newfoundland, in some 1500 fathoms, extending eastward to the Mediterranean." The source of the statement was not given. Bolin[62] reports that the species occurs in the North Atlantic between about 22° and 50°N lat and that it has been reported from Iceland as a straggler in the Gulf Stream. Seven specimens, ranging in size from 53–63 mm, and identified as this species by one of us, were removed from the stomachs of cod caught by otter trawl, at 80–90 fathoms, off Cape Breton, in February 1963. There were two tows, one at 6 p.m. and one at 1 a.m., and on these occasions cod, pollock, and hake were said to be feeding heavily on this species.

Cocco's lanternfish — **Lanterne de Cocco**

Gonichthys coccoi (Cocco) 1829

This species was reported by Halkett[184] as *Rhinoscopelus coccoi* and was said by him to occur off the coast of Newfoundland. Bolin[62] notes that it is common throughout the Atlantic between approximately 45°N and 30°S lat.

No further evidence of its occurrence in our area has been noted.

Benoit's lanternfish — **Lanterne de Benoît**

Hygophum benoiti (Cocco) 1838

Dannevig[102] reported the capture of one specimen of *Myctophum benoiti* (Cocco), 15 mm in length, taken in a surface haul southwest of Grand Bank (lat 42°53′N, long 54°09′W). This, however, is the only report for the species from the area, although Bolin[62] notes that it has been reported northward in the Atlantic to lat 48°N. Since Dannevig's single specimen was small and is apparently unavailable for study, the existence of this species in the Canadian area is based on very meagre evidence.

Mirror lanternfish — **Lanterne-miroir**

Lampadena speculigera Goode and Bean 1879

This myctophid is regarded as being rather common in the North Atlantic and Bolin[62] has noted that it "ranges across the North Atlantic between latitudes of approximately 13° and 51°N." The only record for our area concerns specimens recovered from the stomachs of swordfish taken in the vicinity of Georges Bank in the summers of 1952 and 1953. The specimens were identified by Dr R. H. Backus as *Lampadena braueri* Zugmayer 1914, recognized by Bolin as a synonym for *L. speculigera.*

Jewel lanternfish — **Lanterne-joyau**

Lampanyctus crocodilus (Risso) 1810

This species was reported by Halkett (1913) as *Lampanyctus gemmifer* Goode and Bean 1895 on the basis of a specimen reported by these latter authors from 538 fathoms on the Grand Bank of Newfoundland. Dunbar and Hildebrand[124] reported a number of specimens taken from stomachs of cod caught in Ungava Bay in 1947, 1948, and 1949, in less than 25 fathoms. The 1947 samples were identified as this species by Dr S. F. Hildebrand.

According to Dunbar and Hildebrand, the specimens had the following characteristics—"total length 66 to 126 mm, gill raker counts were approximately 26, vertebrae 43 to 46, dorsal rays 18." Although Bolin[62] notes that the species "is fairly common in the North Atlantic between latitudes of approximately 22° and 51°N." the above appear to be the only records for the Canadian area.

Metallic lanternfish **Lanterne métallique**

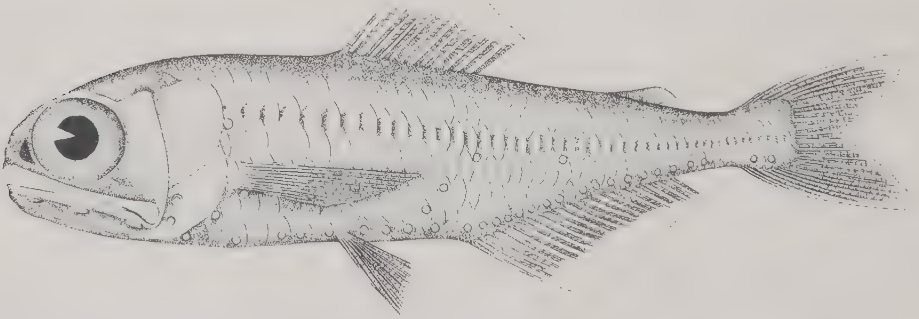
Myctophum affine (Lütken) 1892

Bolin[62] has demonstrated that this species and *M. nitidulum* have been frequently confused, so much so that published records in the main are unreliable. Gibbs[155] has clearly shown how these two species may be differentiated. It is mentioned here because Goode and Bean[170] reported a capture of "*Myctophum opalinum*" from Browns Bank at 104 fathoms (lat 42°21′N, long 65°07′W). There is another record, a specimen in the U.S. Nat. Museum (No. 43785), for *Myctophum opalinum* from off "Cape Sable, N.S. at Lat. 41°47′N, Long. 65°37′30″W." *Myctophum opalinum* appears to be a valid synonym for *M. affine*.

Spotted lanternfish **Lanterne ponctuée**

Myctophum punctatum Rafinesque 1810

DESCRIPTION: Body fusiform, somewhat compressed, depth about 5 in length; caudal peduncle moderate. Head 4¼ in length; snout short, upper profile steep; mouth terminal, maxillary slender, extending beyond posterior edge of eye. Eye large, 2½ in head, close to snout. Fins: dorsal (1), 12–14, inserted nearer to snout than to origin of caudal fin; adipose moderate, its origin above posterior part of anal; caudal forked, slender; anal, 19–22, its origin below last ray of dorsal; pelvics inserted slightly in front of vertical line through origin of dorsal; pectorals inserted high, behind tip of operculum, reaching to middle of base of dorsal. Scales large, 41–45 in lateral line. Photophores: 1 postero-lateral organ; anal organs in 2 groups, 7–9, 7–11; 4 ventral organs at same level; supra-pectoral organ above base of pectoral; 3 mediolateral organs, in a straight, obliquely ascending line, directed to interval between 3rd and 4th ventral organs; 2



organs on lower base of caudal. Adult males have 1–3 fused, supra-caudal luminous plates and adult females 3–5 infra-caudal luminous plates.

Colour, silvery-lustre, otherwise dark.

Distinctions: This lanternfish may be distinguished from others in this area by the presence of three mediolateral photophores in an oblique but straight line. The dorsal and anal fin bases do not overlap as they do in *B. glaciale*.

Size: Up to a length of 4¾ inches.

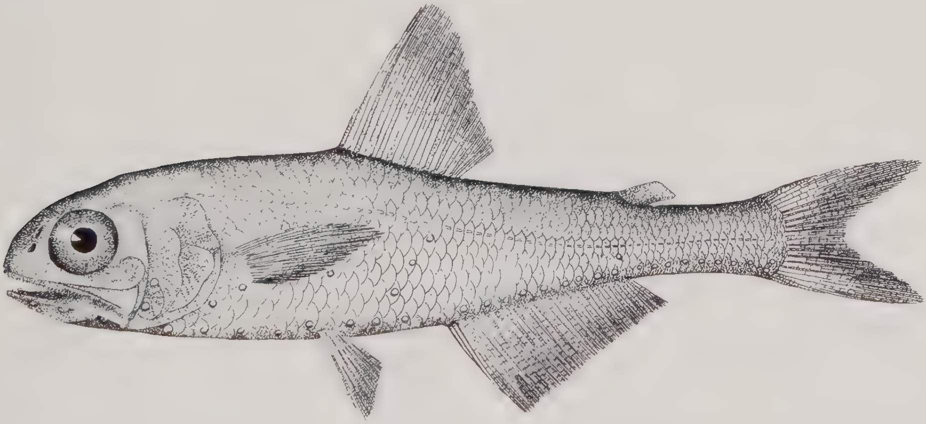
Range: Off Labrador and the Grand Bank. From Iceland and Denmark to the Mediterranean. Pelagic, usually in or over deep waters.

Canadian distribution: There are only three records, one provisionally identified. The latter is reported as differing slightly from the description of this species. A 3½-inch specimen was reported at lat 56°30′ N, long 51°00′ W, September 1950.[245] A one-inch specimen from off the mouth of the Laurentian Channel (lat 42°53′N, long 54°09′W) in 1915.[102] A 4¾-inch (12-cm) specimen, provisionally placed in this species, was taken on the Grand Bank (lat 43°30′N, long 51°00′W) in 80 fathoms, January 4, 1954.

Krøyer's lanternfish — Lanterne de Krøyer

Notoscopelus krøyeri (Malm) 1863

Description: Body slender, elongate, slightly compressed, greatest depth 7½ in total length, occurring at origin of dorsal fin, thence tapering evenly to caudal peduncle; latter heavy. Head 4¾ in total length, compressed, snout blunt, mouth terminal, large, angle far behind posterior edge of eye; narrow bands of cardiform teeth in jaws, a small patch of teeth on each side of vomer, a long narrow band of similar teeth on the palatines. Eye 4½ in head. Fins: dorsal (1), 21, roughly triangular, on middle of back, first rays longest being ⅘ of head length, base equal to head length; adipose small, halfway between end of dorsal and beginning of caudal; caudal moderate, forked, with procumbent rays dorsally and ventrally; anal 18, slightly smaller and shorter than dorsal, origin a little behind middle of dorsal; pectorals small, on mid side, tip not reaching beginning of dorsal; pelvics slightly larger,



base ventral under origin of dorsal. Lateral line present, slightly concave above. Many photophores, about 48 on each side, one luminous patch on upper edge of caudal base. Gill rakers 28–30.

Colour, dark-brown.

DISTINCTIONS: Procumbent rays of caudal are stiff and spinelike, sometimes with luminous tissue, in *Lampadena*, *Lampanyctus* and *Notoscopelus*. These rays are soft and without luminous tissue in *Myctophum* and *Aethoprora*. *Lampadena* has a strong pterotic spine on upper preoperculum; this spine absent in *Lampanyctus* and *Notoscopelus*. The base of dorsal fin longer than that of anal in *Notoscopelus*. They are equal in *Lampanyctus*.[62, 144b]

SIZE: Up to 6½ inches long.

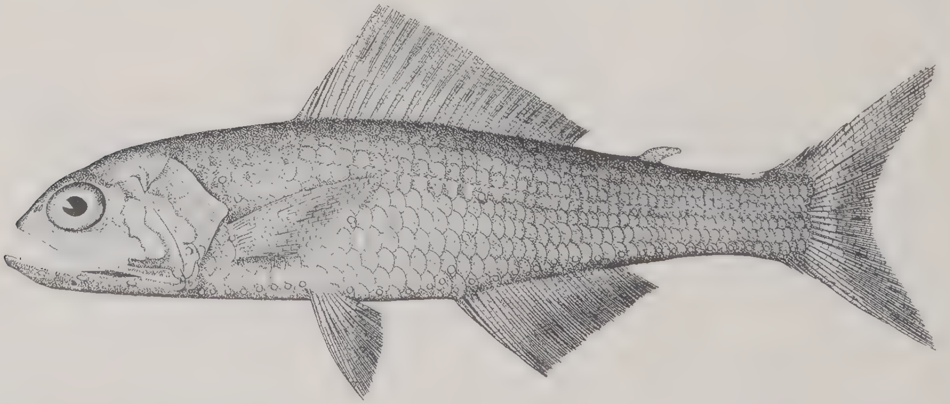
RANGE: Across the North Atlantic Ocean from approximately 37°N lat. to the Arctic Circle; taken at Greenland, Iceland, and Norway.[62, 170]

Canadian distribution: Off Banquereau;[170] in the Laurentian Channel between Cape Anguille, Nfld., and the Magdalen Islands, Que;[18] 15 records off Newfoundland and as far north as off Nachvak, Labrador.

Largescale lanternfish **Lanterne à grandes écailles**

Symbolophorus veranyi (Moreau) 1888

DESCRIPTION: Body fusiform, somewhat compressed, depth 5 in length. Head, 4¼ in length, snout blunt but upper profile of head less steep than in other myctophids; mouth terminal, maxillary reaching much beyond posterior border of eye, posterior end narrow. Eye large, 3 in head, located close to snout. Fins: dorsal (1), 13–14, originating nearer to snout than to origin of caudal; adipose moderate, located above posterior rays of anal; caudal forked; anal, 21–23, inserted behind dorsal; pelvics moderate, origin slightly in front of origin of dorsal; pectorals large, inserted midway between lateral line and ventral midline of body, reaching almost to origin of anal. Scales large, about 40 in lateral line. Photophores: 1 postero-lateral organ; anal organs in 2 groups, 7–9, 7–9; 4 ventral organs at same level;



supra-pectoral organ dorsal to upper end of base of pectoral; supra-anal organs form almost a right angle, the anterior organ of the series above the 2nd ventral organ. Adult male has 2 small, fused supra-caudal luminous plates; the adult female has 2–4 small, infra-caudal luminous plates.

Colour, dark, with silvery-lustre.

DISTINCTIONS: This lanternfish may be distinguished by the position of the 3 supra-anal photophores which form a marked angle.

SIZE: Up to about 5 inches in length.

RANGE: From west of Ireland to the Azores and in the Mediterranean. Western North Atlantic. Pelagic, outside the 200-fathom line.

Canadian distribution: This species has been recorded twice. A 1¼-inch specimen was taken in 1915 ESE from Sable Island on the 200-fathom line.[102] A second specimen, 5 inches (13 cm) long, was dipped at the surface at night, November 10, 1952, off Sable Island Bank at lat 42°51′N, long 61°44′W from the C.N.A.V. *Sackville*. This specimen was identified by Dr R. H. Backus and reported by Leim and Day[265] as *Myctophum humboldti* (Risso), a name regarded as a synonym for *S. veranyi* by Bolin.[62]

Family PARALEPIDIDAE — Barracudinas or lancetfishes

The barracudinas are predaceous forms with large well-toothed mouths and slender bodies, presumably swift and voracious fishes well adapted to a predatory existence. The body is elongate and laterally compressed, the head long, with the eye located in latter half and the large well-toothed mouth gaping back almost to the eye. The dorsal fin is located far back, the adipose fin on the caudal peduncle, anal fin long and the pelvics located abdominally, below dorsal fin.

These fishes are possibly quite numerous in deep open water of temperate and tropical seas and are seldom seen in commercial fishing except when removed from the stomachs of larger fishes. Only two species have been reported from our area but increased exploratory fishing or the use of different gear will undoubtedly reveal the presence of other forms.

KEY to Family PARALEPIDIDAE

1 Body of adults naked except for series of scales along lateral line; teeth in lower jaw well developed in adults .... Genus *Lestidum**

Body of adults covered with small scales, and often evident only as scale pockets; teeth in low jaw of adults short and weak 2

2 Predorsal length in per cent of standard length 63.5–67.3; anal rays 31–34; vertebrae 83–85 ...... White barracudina, *Paralepis rissoi krøyeri* (p. 149)

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*Although not reported to occur within the area, at least three species of this group of barracudinas have been shown to occur east or south of our region[130] and may therefore be reported in the future.

Predorsal length in per cent of standard length 58.0–62.2; vertebrae 64–74 3

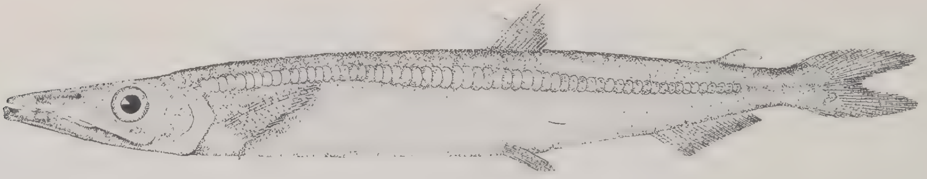
3 Snout length as per cent of standard length for juveniles 14.8–14.9, for adults 12.1–13.1; vertebrae 64–71 .... Short barracudina, *Paralepis brevis brevis* (p. 148)

Snout length as per cent of standard length for juveniles 11.3–12.0, for adults 10.3–11.8; vertebrae 72–74 .... *Paralepis coregonoides borealis*

Short barracudina **Petit lussion**

Paralepis brevis brevis Zugmayer 1911

DESCRIPTION: Body elongate, greatest depth about 8½ in total length, occurring midway between pectoral and pelvic fins, depth diminishing behind dorsal fin and most markedly in region of anal fin. Head 4¼ in total length, upper and lower profiles straight and ending in a pointed snout; mouth terminal, large, angle of mouth just in front of eye, small teeth arranged in pairs in upper jaw. Eye large, diameter 5 in head, located high on head. Fins: dorsal (1), 11–12, third ray longest, being 4 in head, length of base of fin 4½ in head, located half way between gill opening and base of caudal fin; adipose fin located about one-half length of head in front of base of caudal; caudal moderate, forked; anal 22–23, first 3 rays graduated, third longest, being 3 in head, succeeding rays shorter, base of fin about 1½ in head length, fin originates about midway between dorsal and adipose fins; pectorals longer than wide, longest rays 2½ in head length, base located on lower third of side, a short distance behind gill opening; pelvics much smaller, located ventrally under middle of dorsal, longest rays over 6 in head length. Lateral line present. Body covered with moderate easily detached scales.



DISTINCTIONS: The slender form and pointed snout, combined with the small vertical fins, and the presence of an adipose fin identify this fish as a *Paralepis*. It is distinguished from the white barracudina by its smaller number of anal rays (22–23 in *P. brevis*; 31–34 in *P. rissoi krøyeri*); the short barracudina has a deeper body (7–8.5 in the length as compared to 10–12) and a shorter head (3.8–4 in total length as compared to 4.6–4.9). In the short barracudina the pelvic fins are below the 3rd to 5th rays of the dorsal, while they are inserted immediately behind the dorsal in the white barracudina. The distance between the adipose fin and the end of the vertebral column is 9–10% of the total length in the short barracudina and 3–5% in the white barracudina.

SIZE: Up to a length of 22 inches according to Jensen.[219]

RANGE: Adults have been taken off Nova Scotia, eastern Newfoundland, eastern

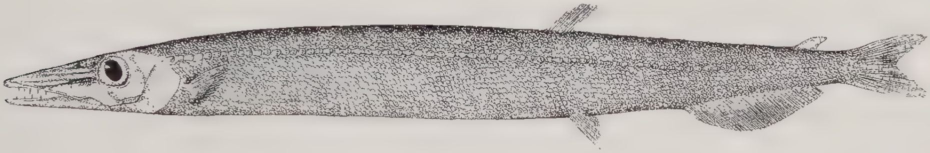
Greenland, Iceland, southern Norway, and off Portugal. The late fry stages have been taken in a band across the North Atlantic Ocean from 18 to 40°N lat, i.e. from New York State to Cuba and across to northern Africa. This indicates a much wider distribution of spawning adults than present captures reveal.[219]

Canadian distribution: Taken from a cod stomach. The cod was caught in deep water, about 20 miles off Bonavista, Nfld. in 1951.[6]

White barracudina **Lussion blanc**

Paralepis rissoi krøyeri Bonaparte 1840

Description: Body elongate, greatest depth about 10 in total length, occurring a little before middle of body, somewhat compressed. Head about 5 in total length, somewhat compressed, snout decidedly pointed; mouth large, lower jaw projecting slightly, angle of mouth in front of eye, a single series of unequal teeth on the jaws and palatines, some of them prolonged, slender and curved, average length of large teeth in lower jaw about 3% of length of snout, small teeth in the premaxillaries close fitting. Eye large, 6 in head, about middle of head. Fins: dorsal (1) 10–11, longest rays 5 in head, length of base of fin 7 in head, located at beginning of posterior third of fish; adipose, height about 7 in head, situated less than twice its own height before base of caudal; caudal small, forked; anal 28–32, first 2 rays short, 3rd ray longest and about 3 in head, succeeding rays gradually shorter, base of fin only slightly shorter than head length, origin of fin about midway between dorsal and adipose, terminating under posterior edge of adipose fin and a short distance before the base of the caudal; pectorals narrow, pointed, longest rays 4 in head, located low on side just behind gill opening; pelvics slightly smaller, located ventrally, and inserted immediately behind dorsal. Lateral line present. Head and body covered with large, easily detached scales.



Colour, silvery, slightly bluish on the back.

Distinctions: The white barracudina can be distinguished by its slender form, posterior position of dorsal fin, and by the presence of an adipose fin (see short barracudina).

Size: Up to a length of 12 inches.[219]

Range: On both sides of the North Atlantic Ocean. Adults are found farther north than the late fry stages, that are known from much of the temperate to tropical Atlantic.[219] Adults are found from Ungava Bay to the Gulf of St. Lawrence; from the coasts of west and east Greenland; from Iceland; from northern Norway; along the coast of the Barents Sea and northern Russia.

Canadian distribution: Nine specimens have been found in the stomachs of cod that were caught in Forbes Sound near Port Burwell, Ungava Bay, in 1947–49.[124] One specimen was caught well off the southern Labrador coast at lat 53°32′N, long 53°41′W in September 1951.[6]

Two specimens were caught off the south coast of Newfoundland at lat 47°10′N, long 56°50′W in 196–205 fathoms and 6 others in the Laurentian Channel, off St. Pierre Bank at lat 46°07′N, long 57°12′W in 150 fathoms; both lots were taken in June 1951.[6] Six specimens were taken in trawls and 16 in redfish stomachs in the region between Cap de la Madeleine and Bonaventure Island in the St. Lawrence estuary in 1953–54.[454]

BIOLOGY AND ECONOMICS: The trawl-caught specimens reported above from the Gulf of St. Lawrence, had eaten euphausiids exclusively. As reported above the barracudina is eaten by cod, redfish, pollock, and seals.[124, 219, 454]

Family ALEPISAURIDAE Lancetfishes

These long, fearsome-looking deep sea fishes are widely distributed in temperate and tropical seas. The jaws are greatly elongated and fitted with large, well-developed teeth, there is no air bladder, no photophores, an adipose fin is present, but most striking is the dorsal fin which extends along the whole of the back from the head almost to the caudal fin.

Two species have been reported to occur in the Atlantic, the most recent form, *Alepisaurus brevirostris* was described by Gibbs.[156] Although not known to occur in our area the range of this new species is not clearly established and all specimens of *Alepisaurus* should, therefore, be carefully examined.

KEY to Family ALEPISAURIDAE

Snout relatively short, the distance from tip of snout to dorsal fin origin being 9–13 per cent of standard length in adults; dorsal fin rays usually 42–45; anal fin rays usually 14 or 15 .... Shortnose lancetfish, *Alepisaurus brevirostris*

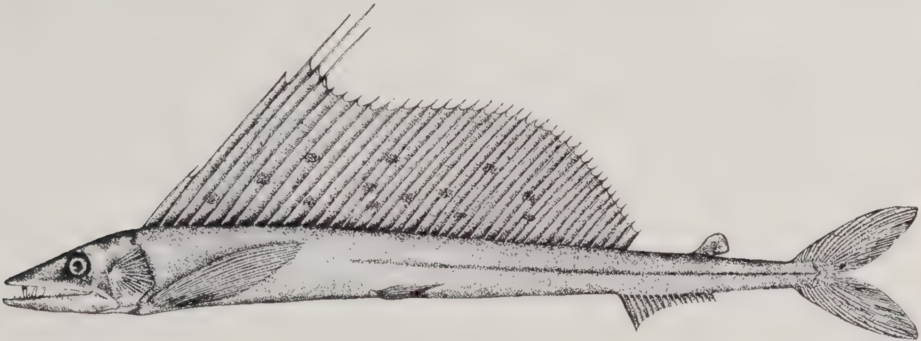
Snout relatively long, the distance from tip of snout to dorsal fin origin being 16–22 per cent of standard length in adults; dorsal fin rays usually 39–42; anal fin rays usually 15–17 .... Longnose lancetfish, *Alepisaurus ferox* (p. 150)

Longnose lancetfish Cavalo féroce

Alepisaurus ferox Lowe 1833

OTHER COMMON NAMES: handsaw-fish

DESCRIPTION: Body elongate, compressed, depth greatest at beginning of dorsal fin, being 11 in total length; body tapers evenly to caudal peduncle. Head compressed, pointed, about 6½ in total length; mouth terminal, extending to posterior margin of eye, lower jaw projecting slightly; teeth very unequal, not movable, each jaw with 2 or 3 large fangs and many smaller teeth; tongue lacks teeth. Eye moderate, 6 in head. Fins: dorsal (1); 41–44, originates above gill opening and extends along three-quarters of back, entire fin can be depressed into dorsal groove; adipose over posterior part of anal fin, higher than long; caudal deeply forked, upper lobe sometimes prolonged in a filament; anal, 14–17, originates under posterior part of large dorsal and ends under posterior part of adipose, first rays longest; pelvics abdominal, located under mid-portion of dorsal, first rays longest; pectorals low on body, a short distance behind gill opening, larger than pelvics but similar in shape, longer than maximum body depth. No scales. Lateral line present.



Colour, sides metallic-silvery, dark above.

DISTINCTIONS: The lancetfish is distinguished from other fishes of the area by its long, high, dorsal fin, combined with the small adipose fin.

SIZE: Up to about 6 feet in length.

RANGE: The lancetfish has been reported from deep water on both sides of the North Atlantic. From the Banks off Nova Scotia south to Block Island. Reported from Madeira. A related species is found in the northeastern Pacific.

Canadian distribution: This species is taken occasionally in 120–275 fathoms off the Nova Scotian coast, most frequently near LaHave Bank; also reported just off Banquereau (lat 44°30′N, long 57°13′W); on Sable Island Bank (lat 43°46′N, long 61°18′W);[170] in "The Gulley" between Sable Island Bank and Banquereau;[513] a 6-foot specimen in the collection of the Boston Society of Natural History was caught off Nova Scotia.[49] In 1953 a Lockeport fisherman caught 3 specimens off LaHave Bank, 2 from 210 fathoms, and 1 from 700 fathoms. One of these was 58 inches long.

Family ANOTOPTERIDAE Daggertooth fishes

This is a small family of highly modified bathypelagic fishes known to occur in the Pacific and Atlantic oceans and closely related to Alepisauridae and Paralepididae. Characteristic of the Anotopteridae is the presence of an adipose dorsal fin only, pelvic fins have 9–11 soft rays and between them are located the anal and genital openings; the mouth is large and well-toothed. Although *Anotopterus* has been associated with percomorph families by various authors, Hubbs et al.[202] have shown that the logical relationship is with the iniomous fishes.

Daggertooth **Pharaon**

Anotopterus pharao Zugmayer 1911

DESCRIPTION: Body very elongate, compressed anteriorly, subcylindrical posteriorly, greatest depth 9½ in total length, occurring midway between anal fin and pelvic fins, depth is less between pectoral and pelvic fins, head deeper, general appearance therefore unusual; body tapering from just before anal fin to a moderate caudal peduncle. Head long, 4 in total length, compressed, pointed, mouth large, angle under eye which is more than halfway back on head, lower jaw projecting markedly, bearing at its tip a conical, nonbony projection, compressed and triangular in shape; about 11 large blade-shaped teeth on the palatines, 2 or 3 of them movable, length of largest equal to eye diameter, all but posterior 2 curved forward slightly, about 50 small teeth in a single row in upper jaw, about 11 canine teeth in single row in lower jaw, length of each about ⅕ eye diameter, lower jaw teeth directed backward. Eye moderate, 15 in head. Fins: dorsal an adipose fin only, its height about twice eye diameter, located far back on body near caudal peduncle; caudal moderate, lunate; anal 13–16, rays short, base 3⅔ in head length, located under adipose fin; pectorals almost rectangular, longest rays 5 in head, base low on side under posterior part of gill opening; pelvics similar, but smaller, located ventrally half way between pectorals and anal. Lateral line present.

Colour of preserved specimens, dark-gray on back, with bluish and golden-metallic tints; sides and belly pale. Front part of jaws blackish.[1]

DISTINCTIONS: This slender fish is readily distinguished by its long jaws, large mouth, and remarkably long blade-like palatine teeth. These teeth resemble those of the lancetfish. The absence of a rayed dorsal fin separates it from the lancetfish.

SIZE: Up to a length of 26 inches.[1]

RANGE: Occurs in deep water in the Atlantic and Pacific oceans. Taken off Labrador and on the Newfoundland Banks; between Madeira and Portugal.[387] In the Pacific Ocean near Japan and near Kamtchatka.[1]

Canadian distribution: It has been recorded twice. A large head of this species was taken from the stomach of a Greenland halibut caught about 160 miles off Hamilton Inlet, Labrador, at lat 54°50′N, long 53°29′W, in 390 fathoms, September 1954.[10] Another specimen, 17 inches long, was taken from the stomach of a cod, caught by a commercial dragger, on the south-eastern edge of the Grand Bank, lat 44°00′N, long 49°05′W, in 150–173 fathoms in October 1952.

Order LYOMERI (Saccopharyngiformes)—GULPERS

This is a highly modified order of rare deep-sea fishes with enormously enlarged mouths and small eyes located near tip of the snout. Photophores are located along the base of the caudal fin. Both dorsal and anal fins are relatively long, the tail is slender and pointed. Many of the features usually accociated with fishes, such as scales, pelvic fins, ribs, air bladder, opercular bones, and branchiostegal rays, are absent in these fishes. Although other groups of fishes may lack one or two of the features noted none lack as many as the Lyomeri.

This is a small order of three families containing less than 10 species of little-known, rare fishes. Only one species in the family Eurypharyngidae occurs in our area.

Family EURYPHARYNGIDAE Gulpers

Pelican gulper **Grandgousier pélican**

Eurypharynx pelecanoides Vaillant 1882

There is little information concerning the occurrence of this species in Canadian waters but it was reported, under the name *Gastrostomus Bairdii* Gill and Ryder

1883, by Goode and Bean,[170] from the area off southern Nova Scotia. Halkett[184] repeated the Goode and Bean record, using the name *Gastrostomus bairdii*, and probably from additional sources of information gave the Canadian range as "Known from Banks of Newfoundland and Davis Strait" and the depth distribution (from Goode and Bean) as 389–1467 fathoms. More recent evidence of the occurrence of the species in nearby waters was given by Schroeder[413] who reported a 430-millimetre specimen taken south of Georges Bank. Schroeder reported the range as "northward to the offing of Nova Scotia."

Order APODES (Anguilliformes)—TRUE EELS

The true eels are a distinctive group of bony fishes whose characteristic shape is so well known that the term eel-like or eel-shaped is widely accepted and understood. But not every elongate, marine creature is an eel and the word "eel" is incorrectly used when speaking of a lamprey as "lamper eel." The lamprey is not an eel, although in general shape it does resemble one.

Eels are most numerous in the shallow waters of warm seas but they also occur in cool seas and in the ocean depths. Members of this order are characterized by the following features: lack of spines in fins, absence of pelvic girdle and pelvic fins (pectoral fin also absent at times); opercle and gill aperture usually small; air bladder with a duct to oesophagus; scales may or may not be present and when present may be embedded; body elongate and with numerous vertebrae.

True eels are classified in about 20 families that comprise several hundred species. Eight species in seven families have been recorded from Canadian Atlantic waters. The families Anguillidae, Simenchelyidae, Muraenidae, Congridae, Ophichthyidae, and Synaphobranchidae are represented by one species each, but the family Nemichthyidae, the snipe eels, is represented by two species. The families Simenchelyidae, Nemichthyidae, and Synaphobranchidae are composed of deep-sea forms.

KEY to Species of Order APODES

1 Pectoral fins absent; dorsal fin origin in advance of circular gill opening .... Green moray, *Gymnothorax funebris* (p. 158)

Pectoral fins present; dorsal fin origin over or behind gill opening 2

2 Jaws prolonged, very slender; body obviously slender; anal opening just behind head or one head length behind (Nemichthyidae) 8

Jaws well developed but not strikingly prolonged; body more or less robust; anal opening far behind head 3

3 Dorsal fin origin posterior to origin of anal fin and anal opening; mouth (gape) extending far behind eye .... Gray's cutthroat eel, *Synaphobranchus kaupi* (p. 163)

Dorsal fin origin in advance of anal fin origin and anal opening 4

4 Dorsal fin origin over posterior margins of pectoral fins .... American conger eel, *Conger oceanicus* (p. 161)

Dorsal fin origin behind posterior margin of pectoral fins 5

5 Snout extended beyond lower jaw and expanded laterally in front like a duck's bill; mouth extending to below posterior margin of eye .... Duckbill oceanic eel, *Nessorhamphus ingolfianus**

Snout blunt or pointed but not expanded to resemble duck's bill; mouth terminating before or behind eye 6

6 Snout blunt; mouth very small, not extending even to anterior margin of eye .... Snubnose eel, *Simenchelys parasiticus* (p. 157)

Snout more or less pointed; mouth extending to or beyond eye 7

7 Dorsal fin origin far behind head; mouth extending barely behind posterior margin of eye; tip of tail soft .... American eel, *Anguilla rostrata* (p. 154)

Dorsal fin origin just behind head (within one head length); mouth extending considerably behind eye; tip of tail hard .... Snake eel, *Omochelys cruentifer* (p. 161)

8 Jaws very prolonged, delicate, flexible; dorsal fin origin in advance of anal fin origin and anus .... Atlantic snipe eel, *Nemichthys scolopaceus* (p. 158)

Jaws prolonged, not delicate; dorsal fin origin behind origin of anal fin and anus .... Stout sawpalate, *Serrivomer beani* (p. 159)

Family ANGUILLIDAE — Freshwater eels

American eel — Anguille d'Amerique

Anguilla rostrata (LeSueur) 1817

OTHER COMMON NAMES: eel, silver eel, anguille commune, elver (young)

DESCRIPTION: Body elongate, rounded in cross-section anteriorly, somewhat compressed posteriorly, tapering to a rounded point at the tail. Head long, 8 in body, conical, mouth terminal, lower jaw projecting, small unequal teeth in bands on each jaw and a patch on vomer. Eye small, 13 in head, placed well forward, over posterior part of mouth. Fins: dorsal, beginning 2½ times length of head from snout, continuing around tail and confluent with anal which extends almost to vent, the latter a short distance posterior to origin of dorsal; pectorals well developed, inserted immediately behind gill opening near middle of side. Gill slit vertical, short, about equal to base of pectoral fin. Lateral line present. Scales small, imbedded, absent in young specimens.

Colour, varies with habitat; black to muddy-brown above, sides tinged with yellow, belly yellowish-white; becoming silvery when approaching maturity.

DISTINCTIONS: The American eel may be distinguished from the conger eel by the position of the dorsal fin, in the eel it originates far behind the pectoral fin, whereas it originates just behind the pectoral in the conger. The eye of the American eel is smaller than that of the conger. It has fewer vertebrae than the European eel (about 107 as compared to about 114).

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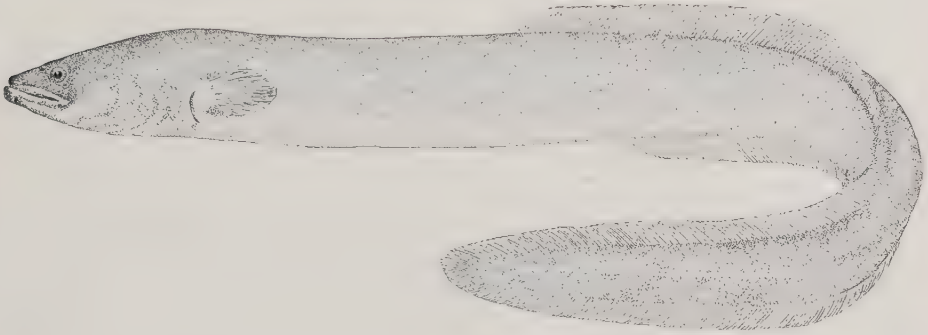
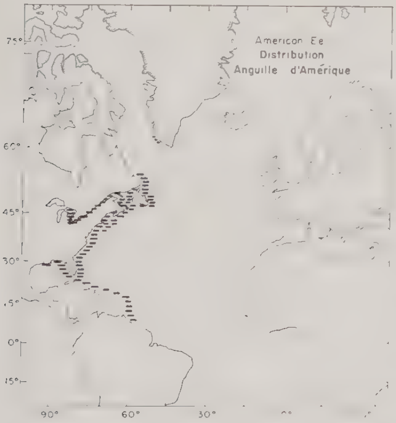
* Recently reported from the Canadian region.



SIZE: Females up to 3½ feet in length, males up to 2 feet in length.

RANGE: The American eel ranges along the North American coast from its northernmost specific record in the Hamilton Inlet–Lake Melville estuary on the coast of Labrador[25] southward in the Strait of Belle Isle, the Gulf of St. Lawrence and Newfoundland to the Gulf of Mexico, Panama, and the West Indies. It occurs in coastal areas and in fresh waters to the Great Lakes and up the Mississippi River. Occasionally this species is taken off the northern coast of South America and Bermuda.



Jensen[215] noted that the West Greenland records consist of no more than 6 specimens taken over the period from 1841 to 1920.

Canadian distribution: In rivers, lakes, and estuaries. In the Hamilton Inlet–Lake Melville region.[25] In most accessible rivers and lakes from the Strait of Belle Isle, northern Newfoundland, Anticosti Island, and the north shore of the Gulf of St. Lawrence[269] to the United States border. Up the St. Lawrence and Ottawa rivers; Lake Ontario and sparingly in lakes Erie and Huron, a few individuals gaining access through the Welland Canal.[309]

BIOLOGY AND ECONOMICS: The American eel is the only catadromous species living in the area under consideration; that is, it lives much of its life in fresh water and returns to the sea to breed. There are indications that some eels remain in brackish estuaries and do not enter fresh water at all. Its life history as revealed by the Danish biologist, Dr Johannes Schmidt, is of exceptional interest. Adult eels go to deep water off the continental shelf, perhaps to the south of Bermuda where they spawn. The young that result regain the coast where they enter streams of all sizes (or estuaries) as elvers. They migrate upstream in May and June and travel varying distances from a few yards to hundreds of miles. As no reproduction takes place in fresh water those eels found in the Great Lakes or upper Mississippi River must have travelled that far from the spawning area.

The exact breeding grounds of the American eel cannot be specified but they are known to be in deep water between latitudes 20° and 30°N, and longitudes 60° and 78°W, that is, east of Florida and the Bahamas and south of Bermuda. There may be other deep-water areas farther north where they spawn also. The spawning grounds of the American and European eels probably overlap.

As eels approach the size of maturity in autumn they leave the lakes and rivers and return to the sea, where full maturity is achieved. The eggs have not been found in the sea but are presumed to be released in the deep waters mentioned above. They spawn in midwinter and the adults are not seen again. The eel is very prolific and females produce from 5 to 20 million eggs. It is presumed that the eggs and larvae require water of high temperature and high salinity for development.

The eggs hatch into elongate larvae with large teeth; these soon develop into the "leptocephalus" stage which is transparent, broad and ribbon-like. They remain in this stage for about 1 year, during which time they are carried or swim actively toward shore. They next transform into the elver stage—the body narrows and shortens slightly, finally becoming almost cylindrical. These elvers or "glass eels," at first unpigmented and transparent, appear in estuaries on the Canadian shores in April. In May and June they are ascending into fresh water in large numbers. On entering fresh water they become heavily pigmented and are almost black. In rivers and streams they swim close to shore, where opposing currents are at a minimum.

The elvers are 2½ to 3 inches long when they enter fresh water and are over a year old. Scales do not appear until the 3rd year when the fish are 6–8 inches long. Eels, whose scales show 6 and 7 rings, are presumed to be from 9 to 11 years old; they are from 24 to 28 inches long. This is based on a study of eels from lakes in southern New Brunswick.[442a]

The eel eats voraciously, chiefly at night, and feeds on any small fishes or invertebrates that are available. Young alewives are eaten extensively; salmon and trout fry are found in eel stomachs, although the eel tends to avoid the cooler waters that these species prefer.[442a] They will eat the viscera and occasionally the flesh also of salmon or shad that are caught in gill nets. In estuarine and brackish water they eat many kinds of small fishes, shrimps, crabs, and small Crustacea.[49]

American eels are much more abundant than commercial catches indicate, chiefly because they are not in great demand as food. In some instances eels have been trapped as they leave lakes and there is a record of 446 pounds of eels leaving a 50-acre New Brunswick lake in 4 years. The highest estimate of a standing crop was almost 71 pounds of eels per acre in a small, shallow lake where all the fish were killed off.[442a]

The catch of American eels from the Canadian Atlantic area for 1962 was 729,000 pounds, with a value of $156,000.[70b]

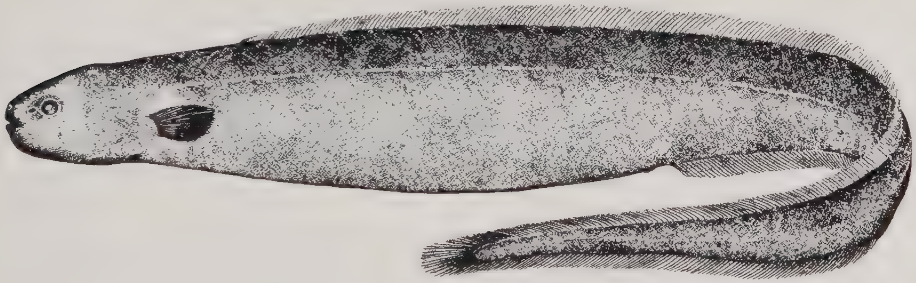
Family SIMENCHELYIDAE — Snubnose eels

Snubnose eel — **Anguille à nez court**

Simenchelys parasiticus Gill 1879

OTHER COMMON NAMES: slime eel

DESCRIPTION: Body elongate, eel-like, soft and slimy, greatest depth is slightly more than length of head and occurs a short distance in front of vent; body tapers steadily from vent to tail; tail slender. Vent slightly nearer to snout than to tail. Head small, 10–11 in total length; snout very blunt and rounded; mouth terminal, small, extending less than halfway from snout to eye; jaws equal and with a single series of small, rounded, close-set, incisor-like teeth. Eye 9 in head. Gill openings small, longitudinal, set low on "throat" region. Fins: dorsal begins a short distance behind tip of pectorals or a head's length behind gill openings and is continuous around the tail and confluent with anal; anal begins slightly behind vent; all vertical fins are low; pectorals moderately developed, $\frac{2}{5}$ length of head, located behind head and below lateral line. Scales embedded in skin.



Colour, dark-brown, nearly plain, under parts lighter.

DISTINCTIONS: The snubnose eel may be distinguished from the American eel, the conger, and the longnose eel by its short snubnose head and by the small mouth which gapes only half way to the eye instead of to under the eye or beyond. The dorsal fin of the snubnose eel originates much farther forward than does that of the American eel and not quite as far forward as that of the conger. The snubnose eel has horizontal gill slits, very low on the sides; the American eel and the conger have vertical gill slits higher up. The body of the snubnose eel is stouter forward than that of the others but it has a more tapering tail.

SIZE: Up to 2 feet in length.

RANGE: In the western North Atlantic it occurs along the continental slope and on the slopes of offshore banks from south of Newfoundland to off Long Island in depths of 200–900 fathoms or more. It occurs at the Azores. A closely related species is found in Japanese waters.

Canadian distribution: All the known records are of long standing. They were from Banquereau in 200 fathoms; from lat 44°28′N, long 56°24′W (south of St. Pierre Bank); from lat 43°48′N, long 59°00′W (Sable Island Bank); from lat 42°47′N, long 63°10′W and lat 42°33′N, long 64°20′W (outside LaHave Bank).[170]

BIOLOGY AND ECONOMICS: The snubnose eel is partly parastic in its habits, burrowing into the flesh of halibut and other large fish. It also lives independently on bottom. It is able to produce large quantities of mucus.[49]

Family MURAENIDAE — Morays

Green moray — **Murène verte**

Gymnothorax funebris Ranzani 1840

DESCRIPTION: Body moderately elongate, eel-like, rounded in cross-section, largest just behind head. Head 7 in total length, conical; mouth terminal, 2½ in head, jaws armed with strong canine-like teeth, about 32 in upper jaw and 26 in lower jaw, one or more long depressible canines in midline of upper jaw, about halfway between snout and eye; 2 rows of smaller teeth on vomer, about 8 in each row, the rows approaching each other posteriorly. Nasal pits, circular, anterior ones almost terminal, posterior ones just in front of eye. Gill opening short, oblique. Eye 15 in head, 3 times its diameter from tip of snout. Fins: dorsal begins slightly in front of gill opening and, including the tail, is continuous with the anal; anal begins at posterior edge of vent, which is midway between snout and tip of tail. Body and fins covered by thick, leathery skin, scaleless.

Colour, brilliant-green to brownish or slaty-gray, sometimes with faint dark lines running lengthwise on lower part of head. Dorsal and anal fins with dark lines running lengthwise.

DISTINCTIONS: The morays are distinguished from all other eels by the lack of both pectoral and pelvic fins. The small, almost circular gill openings are characteristic. The moray is distinguished by the canine teeth and the dorsal fin originating over the head.

SIZE: Up to 6 feet in length.

RANGE: Tropical America in Atlantic and Pacific oceans. Common from Florida to Rio de Janeiro, Brazil. Also at Bermuda.

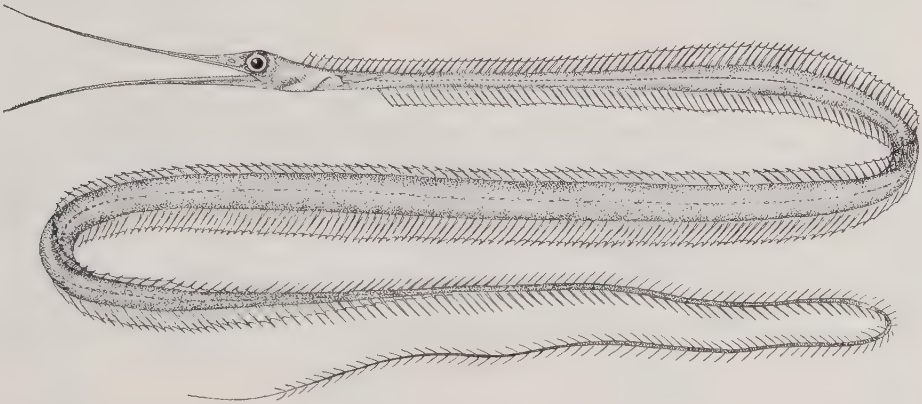
Canadian distribution: Only one record is known. A stray moray was speared at Eastern Passage, Halifax Harbour, Nova Scotia, on August 30, 1952.[205] It was kept alive for some hours before being turned over to an employee of the Fisheries Research Board. This specimen, 5 feet 8 inches long and weighing 33 pounds, is now in the Royal Ontario Museum (Cat. No. 15761).

Family NEMICHTHYIDAE — Snipe eels

Atlantic snipe eel — **Avocette ruban**

Nemichthys scolopaceus Richardson 1848

DESCRIPTION: Body very elongate, depth about 75 in total length; tail slender and whiplike. Head comparatively stout; mouth terminal, jaws greatly elongated forming a slender bill twice length of remainder of head, upper jaw curving upward; mouth gapes to below middle of eye; teeth in both jaws small, numerous, recurved. Eyes large, 12 in total length of head including bill, situated above posterior part of mouth. Gill slits lateral, running downward and forward, nearly confluent but distinct. Vent below pectoral fin, close to head. Fins: dorsal beginning above gill slits and extending to tip of tail, anterior half soft-rayed, its height about equal to body depth, posterior half lower, the rays stiff and spine-like; anal begins behind vent, about as high as body is deep and extends to tail, tapering to almost nothing; pectorals small, on sides, above and behind gill slits; rays of dorsal and anal fins connected by a thin membrane. Body scaleless. Lateral line represented by rows of pores.



Colour, pale-brown above; anal fin blackish and underparts black.

DISTINCTIONS: The Atlantic snipe eel is readily distinguished by its extremely slender body and by the bill-like jaws. The dorsal and anal fin rays are connected by a thin membrane and are not embedded in thick skin as they are in other eels.

SIZE: Up to a length of 36 inches.

RANGE: In 250–2000 fathoms on the continental slope of North America from south of Sable Island Bank to off South Carolina. Also in the South Atlantic; near the Azores and Cape Verde Islands; off West Africa; in the Pacific Ocean near New Guinea.[49]

Canadian distribution: It was reported from the "fishing banks off the coast" of Nova Scotia.[232] More recently, a number of specimens were captured along the continental slope south of Sable Island Bank,[288] quoted by Vladykov and McKenzie.[513] It has been reported a number of times in 300–700 fathoms south of Browns Bank at lat 41°47′N, long 65°37′W and at other positions in that vicinity.[170]

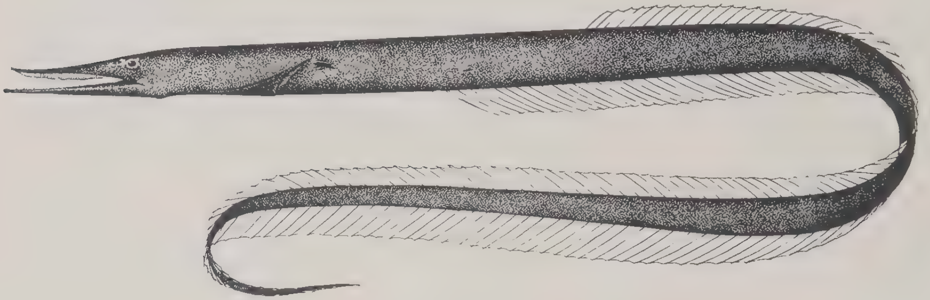
Stout sawpalate Serrivomer trapu

Serrivomer beani Gill and Ryder 1883

OTHER COMMON NAMES: shortnosed snipe eel

DESCRIPTION: Body very elongate, slightly compressed, greatest depth about 30 in total length, occurring in region of gill opening, body tapering very gradually to a whip-like tail.

Head elongate, about 7 in total length, jaws prolonged, the lower projecting slightly and about ½ length of head; angle of mouth under posterior edge of eye, 50–80 large, crowded, lancet-shaped teeth on the vomer, very numerous, small, recurved teeth in each jaw. Eye small, 17 in head, located high on head. Fins: dorsal 159–165, fin beginning about one head-length behind gill opening, over 11th to 13th anal ray, and continuing to tip of tail, longest rays about 9 in head length, anterior and posterior rays soft, intermediate ones spine-like; caudal not distinguishable from dorsal and anal; anal 124–140, beginning behind vent and continuing to tip of tail, rays a trifle longer than those of dorsal; pectorals small, located on middle of sides just behind upper part of gill opening; pelvics absent. Lateral line pores present. No scales.



Colour translucent, back pale, lower parts of body dark, with a high, bronzy-iridescence when fresh.[36]

DISTINCTIONS: The stout sawpalate is distinguished by its very slender body and elongated jaws. It is stouter than the other snipe eel (*Nemichthys scolopaceus*) and its jaws, while elongated, are not bill-like as in *Nemichthys*. The dorsal fin begins at least a head length behind the gill opening; in *Nemichthys* it begins over the gill opening. The strong vomerine teeth are characteristic and their number, 50–80, distinguishes adult specimens from a related Atlantic species, *S. brevidentatus*, which has 20–30 vomerine teeth.

SIZE: Up to a length of 26¾ inches (Newfoundland specimen).

RANGE: The stout sawpalate has been reported at depths between 250 and 850 fathoms near the Grand Bank and on the edge of the continental shelf south of Browns Bank. Recorded on the edge of the continental shelf off Long Island.[413] Frequent near Bermuda in 50–1000 fathoms; off the Azores and off the Bahamas in depths up to 3000 fathoms.[36] A related species occurs in the Pacific and Indian oceans.[36]

Canadian distribution: The specimen from which the species was described, was caught south of Browns Bank at lat 41°40′30″N, long 65°28′30″W in 855 fathoms.[170] Seven specimens were caught in July 1956, one on the southwest edge of the Grand Bank at lat 42°58′N, long 50°44′W and six specimens north of Flemish Cap in the neighbourhood of lat 48°28′N, long 44°50′W in 250–400 fathoms.[11]

Family CONGRIDAE — Conger eels

American conger eel **Congre d'Amerique**

Conger oceanicus (Mitchill) 1818

OTHER COMMON NAMES: sea eel

DESCRIPTION: Body elongate, rounded anteriorly, somewhat compressed posteriorly, tapering to a point at tail. Head depressed above, pointed anteriorly, 7 in total length. Mouth terminal, upper jaw projecting slightly; gaping to below middle of eye; teeth present in rows on both jaws, one row in upper jaw set so close together as to form a cutting edge. Eye oval, 8 in head. Fins: dorsal beginning above or slightly behind tip of pectoral, continuous with tail and anal; anal begins midway between snout and tail; pectorals behind and slightly above gill slits. Gill openings moderate in length, vertical, low on sides. Skin scaleless. Lateral line present.

Colour, generally grayish, dingy-white on ventral surface; margins of dorsal and anal fins black.

DISTINCTIONS: The conger eel may be distinguished from the American eel by its larger eye which is oval rather than round. In the conger the dorsal fin originates much farther forward on the body than it does on the American eel.

SIZE: The conger eel reaches a length of 7 feet and a weight of 22 pounds.[49]

RANGE: Continental shelf of eastern North Atlantic. Adults from Cape Cod south; larvae occur farther north to off Nova Scotia. The same or a closely related species occurs on the coast of South America.

Canadian distribution: Only larval forms are reliably reported in Canadian waters. A "Leptocephalus" stage, 4 inches long, was caught with plankton on August 20, 1954, on LaHave Bank at lat 43°05′N, long 64°10′W. Another larva of similar size, taken in Passamaquoddy Bay, July 11, 1956, is provisionally considered to be this species.

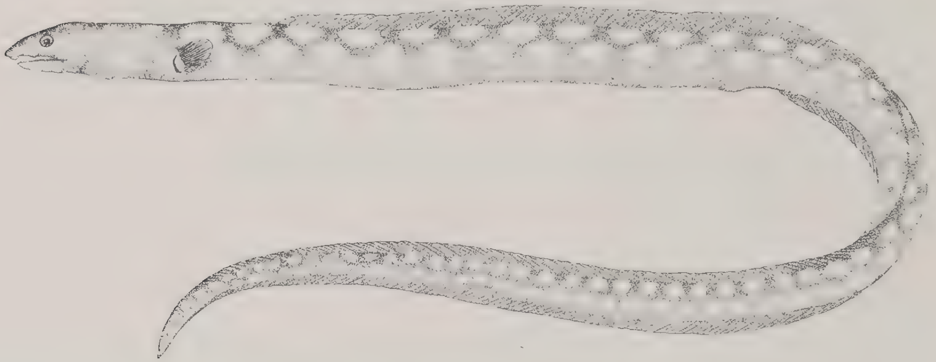
BIOLOGY AND ECONOMICS: The conger eel occurs from the coastline to the edge of the continental shelf. It moves offshore to spawn. The discovery of very young larvae in the West Indies region indicates that they breed there. Female conger eels produce up to 6 million eggs. The parents die after one spawning. The conger, like the American eel, passes through a ribbon-like "leptocephalus" stage; this larva is narrower, but longer (up to 6 inches long) than that of the eel, *Anguilla rostrata*. Adult congers feed on small fishes, including herring, and on shrimp, crabs, and small molluscs.

Family OPHICHTHIDAE — Snake eels

Snake eel **Serpent de mer**

Omochelys cruentifer (Goode and Bean) 1896

DESCRIPTION: Body very elongated, eel-like, greatest depth about 30, or more, in total length, tapering from vent to pointed tail. Head 12 in total length, snout blunt, depressed; mouth about $\frac{1}{3}$ length of head, upper jaw projecting, angle of mouth beyond posterior edge of eye, small teeth in bands on jaws and on vomer. Eye moderate, 10 in head, placed well forward on head. Gill openings small, lunate. Fins: dorsal, rays many, most of them 4 in head, first and last ones shorter, fin begins almost a head length behind gill openings and continues along much of the body, ending a short distance before tip of tail; no caudal fin; anal, rays many, about $\frac{1}{2}$ height of dorsal, fin beginning behind vent and about 5 head lengths behind snout, continuing to near tip of tail; pectorals small, 3 in head length, rounded, base midway between lateral line and ventral edge and just behind gill opening; no pelvic fins. Lateral line present.



Colour, described as uniform brownish-yellow, but the specimen taken in Canadian waters was described[426] as spots on dorsal surface presenting a regular and alternating, black and white, mesh-like pattern.

DISTINCTIONS: The snake eel has a more slender body than the American eel, the snubnose eel, and the longnose eel. The tip of the tail is hard and pointed and without fin rays, whereas in all the other eel-like species the dorsal and anal fins are continuous around the tip of the tail.

SIZE: Up to a length of 22 inches.[426]

RANGE: The snake eel has been reported from a few locations in the western North Atlantic Ocean, in depths down to 245 fathoms. Reported from the Laurentian Channel; and from the western Gulf of Maine, the edge of the continental shelf off Nantucket and south to off Cape Henry.[49, 170] Closely related species are known from the West Indies and from the Indian Ocean.

Canadian distribution: A single specimen is recorded. It was taken from the stomach of a swordfish in July 1958. The swordfish was caught in the Laurentian Channel at lat 45°30′N, long 57°10′W.[426]

BIOLOGY AND ECONOMICS: It is thought that this fish sometimes bores into the flesh of larger fishes.[170]

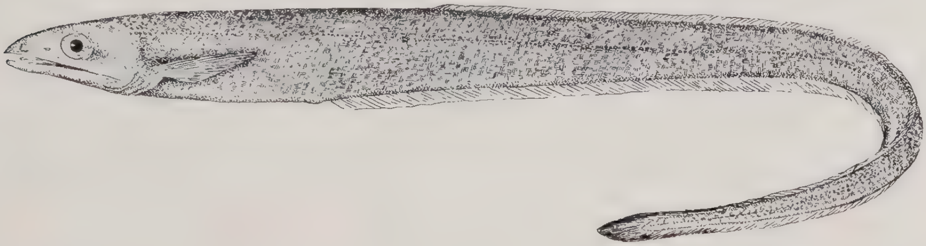
Family SYNAPHOBRANCHIDAE — Cutthroat eels

Gray's cutthroat eel — **Anguille égorgée de Gray**

Synaphobranchus kaupi Johnston 1862

OTHER COMMON NAMES: longnose eel

DESCRIPTION: Body elongate, eel-like, moderately compressed anteriorly, much compressed toward end of tail; deepest at vent which is located ⅓ of total length from snout; tapering gradually from there to tip of tail; maximum depth less than length of mouth. Head long and pointed, 8⅔ in total length; mouth terminal, long, ¾ length of head, jaws about equal, upper one with projecting fleshy tip; each jaw with a broad band of small, conical, sharp teeth, becoming a single series anteriorly; teeth on vomer in single patch. Eye moderately large, about 7 in head, located over middle of mouth. Gill openings longitudinal, on lower side of "throat," joined together anteriorly to form a V but separated within. Fins: dorsal (1), low, beginning about a head's length behind vent, continuous around the tail with the anal; anal begins just behind vent and is longer than dorsal, also higher; pectorals moderate, ⅖ length of head, located just above and behind gill slits. Lateral line present. Scales embedded in skin.



Colour, uniform brown, vertical fins light-edged anteriorly, darker behind; inside of mouth blue-black.

DISTINCTIONS: Distinguished from the other eels by the dorsal fin originating behind the vent, so that the anal originates farther forward than the dorsal. The large mouth extending for half its length behind the eye, also distinguishes Gray's cutthroat eel; all the other eels have shorter mouths, not extending beyond the eye.

SIZE: Up to 26 inches in length.

RANGE: A deep-water species with wide distribution. In the western North Atlantic it is found along the continental slope from the Grand Bank to off South Carolina. Occurs from south of Iceland and the Faroes to northern Spain and at the Azores and Canary Islands. Also in the south Atlantic and Pacific oceans. From 130 to about 2000 fathoms. *Synaphobranchus pinnatus* (Gronow) is a synonym.

Canadian distribution: Eleven specimens were reported during 1952–1954 along the southern edge of the Grand Bank in 130–300 fathoms; some were taken at lat 44°26′N, long 53°18′W, and others south and east of this along the Bank edge. Many were trawled south of LaHave Bank in 400–460 fathoms at lat 42°38′N, long 64°04′W in 1949.[49] Also reported from Banquereau and Sable Island banks.[513] Many years ago the species was reported from between Browns and Georges banks at lat 41°53′N, long 65°35′W and lat 41°40′N, long 65°35′W.[170]

Biology and Economics: Little is known of the life of this fish. It will take baited hooks. It spawns in May and June and the young pass through a leptocephalus stage.[49]

Order HETEROMI (Notacanthiformes)
Tapirfishes or Spiny Eels

The notacanths are generally regarded as deep-sea fishes. The elongate form of the body and the presence of apparently isolated dorsal and anal spines have given rise to the name "spiny eels." The relationships of this order of fishes are not well understood, but recent work by Marshall[279] suggests that the eels (order Apodes) and the spiny eels may have had a common ancestor, thus indicating a close relationship between these two groups of fishes. These are elongate fishes, the body tapering to a point, mouth inferior, dorsal fin with spines, anal fin of spines and soft rays, pelvic fins abdominal and pectorals somewhat elevated on the sides.

At least 2 families are recognized, the Notacanthidae and the Lipogenyidae,* both of which occur in the Canadian Atlantic region.

KEY to Order HETEROMI

1 Dorsal spines not isolated, but a dorsal fin of 5 graduated spines and 5 soft rays is present .... Backfin tapirfish, *Lipogenys gillii**
Dorsal spines 6–34 in isolated series along back 2

2 Dorsal spines 6–12 .... Largescale tapirfish, *Notacanthus nasus* (p. 165)
Dorsal spines 27–34 .... Shortspine tapirfish, *Macdonaldia rostrata* (p. 164)

* Not considered in detail but known to occur in the area.

Shortspine tapirfish **Tapir à petites épines**

Macdonaldia rostrata (Collett) 1889

Other common names: spiny eel

Description: Body elongate, much compressed, greatest depth 11–12 in total length, occurring at origin of anal fin, body tapering in both directions from this region, the tail gradually coming to a point. Head 9 in total length, bluntly pointed, upper profile convex, lower profile straight; mouth inferior, small, angle well in front of eye, a series of minute teeth in each jaw and on the palatines. Eye 7 in head. Fins: dorsal (1) XXVIII–XXXI, consisting entirely of short, stout spines that are independent of one another, the first 5 smaller, the others uniform, about ½ as long as the eye diameter, first spine a short distance behind gill opening, last spine over beginning of posterior third of body, the spines evenly distributed, the spaces between them greater than their height; no distinguishable caudal; anal XLII–LIII, first 5 spines graduated, followed by uniform spines slightly longer than the eye diameter, until the rays gradually shorten in the posterior third, fin begins immediately behind vent or under

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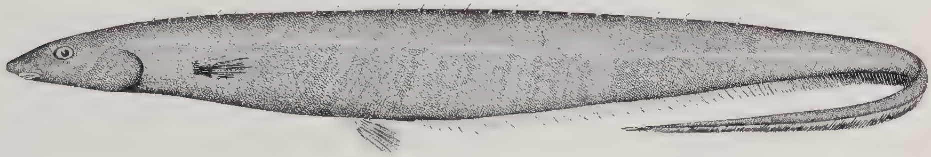
* A record for *Lipogenys gillii* Goode and Bean 1895 is being published.

14th dorsal spine, the rays more crowded and less spine-like behind a perpendicular through the last dorsal spine; pectorals moderate, longest rays 2 in head, located midway between lateral line and ventral edge of body, about ⅔ their own length behind gill opening, base under 3rd dorsal spine; pelvics about same size as pectorals, bases separate, located on ventral edge of body, their own length before vent, base under 11th or 12th dorsal spine. Lateral line apparent from above gill opening to tail; a line of mucous pores extends from the anterior end of the lateral line forward under the eye to the end of the upper jaw. Body and head covered with small scales.



DISTINCTIONS: The shortspine tapirfish resembles *Notacanthus nasus* in its elongated body, that tapers to a pointed tail and in its inferior mouth. It is readily distinguished from the latter by having 28 or more dorsal spines, whereas *N. nasus* has no more than 11; it has a more pointed head and a smaller mouth than *N. nasus.*

SIZE: Length up to 17 inches.[170]

RANGE: This species has only been recorded in the western North Atlantic Ocean. Found along the southwest edge of the Grand Bank and on the edge of the continental shelf due south of Martha's Vineyard, Massachusetts,[170] in depths of 230–960 fathoms.

Canadian distribution: A specimen was taken many years ago off Newfoundland in 690 fathoms, but the location was not given.[170] In July 1953, 4 specimens were caught on the southwest edge of the Grand Bank at lat 44°03′N, long 52°37′W in 230–360 fathoms.[8]

Largescale tapirfish **Tapir à grandes écailles**

*Notacanthus nasus** Bloch 1795

OTHER COMMON NAMES: spiny eel

DESCRIPTION: Body elongate, somewhat compressed, greatest depth 9–10 in total length, occurring between pectoral and pelvic fins, tapering very gradually from the pelvic fins to tip of tail. Head 8½ in total length, snout bluntly rounded, somewhat compressed; mouth moderate, inferior but horizontal, snout projecting above mouth, jaws about equal, angle under front edge of eye, about 32 slender, comb-like teeth, closely set on each side of upper jaw, teeth in lower jaw shorter, more slender, placed in 2 rows, 2 series of slender, sharp teeth on palatines. Eye 9 in head, located high on side of head. Fins: dorsal (1) IX–XI, spines short, stout, separate, highest 9 in head, first very short, second and third gradually longer, others approximately equal, first spine located over base of pelvic fin, remaining spines distributed over a distance that equals almost twice length of head; caudal very small, scarcely distinguishable from anal; anal XIII–XIX, 116–130, first spine very short, located under 4th dorsal spine, remaining spines increasing in length gradually, soft rays follow immediately and continue to tip of tail, middle ones longest, being about 4 in head; pectorals rounded, longest rays 2½ in head, located below lateral line and a short distance behind gill opening; pelvic fins almost as large as pectorals, end more truncated, 1 or 2 spines precede the soft rays, located ventrally, about twice head length behind base of pectorals. Lateral line evident from upper part of gill opening to tail. Head and body covered with small, thin scales.

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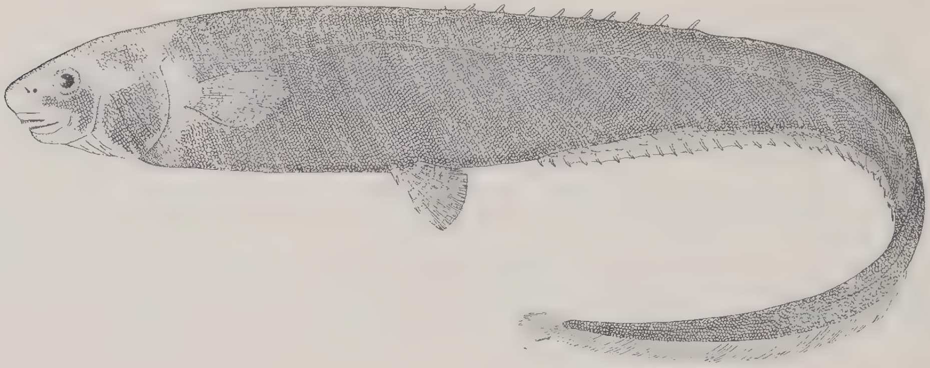
* Although *Notacanthus nasus, N. phasganorus,* and *N. chemnitzi* have been reported from the area, we have treated here only *N. nasus.* The state of confusion surrounding the identification of *Notacanthus* spp. suggests that for present purposes, *N. phasganorus* and *N. chemnitzi* be considered as synonyms of *N. nasus.*



Colour, light-brown throughout, but posterior margins of gill covers and margin of upper lip, a brilliant light-blue.

DISTINCTIONS: The largescale tapirfish is readily identified by its slender eel-like shape, by the relatively short dorsal fin of detached spines, by the projecting snout, and by the presence of pelvic fins. The American eels have no pelvic fins; the ocean pout has a long dorsal fin, most of which is soft-rayed.

SIZE: Up to 39 inches long.[265]

RANGE: Found in deep water in various parts of the Atlantic Ocean. Occurs from Iceland to west Ireland,[409] near South Greenland,[170] on the Grand Bank and south of Sable Island.

Canadian distribution: A spiny eel was reported from the Grand Bank (as *N. phasganorus*) many years ago.[170] In recent years the species has been recorded frequently from the southern and western edges of the Grand Bank.[5, 6, 265] One specimen was recorded and another seen 20 miles south of Sable Island in 100 fathoms, where one was caught February 10, 1935.[49, 304] They have been caught more frequently in recent years.

Order SYNENTOGNATHI (Beloniformes)

SAURIES AND FLYINGFISHES

This order includes the flyingfishes, sauries, halfbeaks, and needlefishes. All are soft-rayed fishes having abdominal pelvic fins with 6 rays, posterior dorsal fin, elevated position of pectoral fins, cycloid scales, air bladder without a duct to the gut, and the lateral line located low on the side along the ventral outline of the body.

The order is usually subdivided into two suborders, the Scombresocoidea, containing the needlefishes and sauries with small scales and elongate or produced jaws and, secondly, the Exocoetoidea, containing the flyingfishes and halfbeaks, fishes that in general have large scales and small mouths.

These are fishes of the shallow surface waters and even the non-flying ones have developed the jumping habit to a remarkable degree—a characteristic that has reached its greatest development in the flyingfishes themselves.

Although about 100 species occur in the order, only four species in three families have been recorded from the Canadian Atlantic.

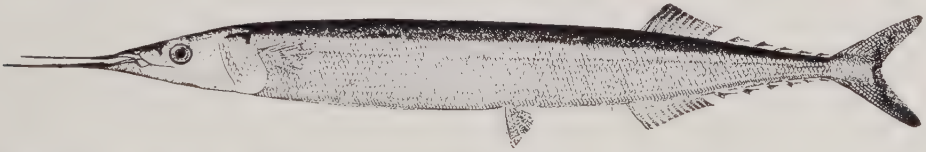
Family SCOMBERESOCIDAE Sauries

Atlantic saury **Balaou**

Scomberesox saurus (Walbaum) 1792

OTHER COMMON NAMES: needlefish, billfish, skipjack, skipper, saurel, aiguille de mer

DESCRIPTION: Body elongate, only slightly compressed, depth 9–10 in length, tapering from dorsal fin region to a moderately slender caudal peduncle. Head broad above, otherwise pointed, 3½ in length, both jaws prolonged in a slender beak, lower jaw slightly longer, about 2 in total head length, mouth otherwise small, its posterior angle well in front of eye; teeth weak. Eye moderate, 12 in total head length. Fins: dorsal (1), 10–12, well back on body, originating about ⅔ of distance from eye to fork of tail, longer than high, followed by 5–6 small finlets filling the space between the dorsal and caudal; caudal moderate, deeply forked; anal, 12–13, under but slightly in front of dorsal, which it resembles in size, followed by 6–7 small finlets that extend from the anal to the caudal; pectorals on sides behind gill opening; pelvics abdominal, about midway between eye and base of caudal. Body and part of operculum covered by small, easily detachable scales, 115 rows on side. Lateral line present and low on side.



Colour, olive-green above, lateral scales with bluish tints, a silvery band along sides at eye level; lower parts silvery; a dark-green spot above base of each pectoral fin; dorsal fin greenish.

DISTINCTIONS: The Atlantic saury is readily distinguished by its slender beak, formed by the prolongation of both jaws, by the rearward position of the dorsal and anal fins and by the small finlets which follow on the caudal peduncle. It is more slender than the members of the mackerel family which it superficially resembles.

SIZE: Rarely over 17 inches in length.

RANGE: Temperate parts of the Atlantic; on the coasts and in open seas. In the western Atlantic it occurs from eastern Newfoundland southward to North Carolina and the West Indies; abundant south of Cape Cod and occasionally on the Nova Scotian coast. In Europe it occurs from Norway to the Mediterranean.

Canadian distribution: Most abundant on the outer coast of Nova Scotia, where in some years moderately large quantities occur in St. Margaret's Bay. Abundant in some years on the east coast of Newfoundland in Notre Dame, Bonavista, and Trinity bays.[474] Reported from Placentia Bay and southwestern Grand Bank.[17, 18, 20] It has been reported several times, but always sparingly, in the southern part of the Gulf of St. Lawrence; in Miramichi Bay;[93, 312] at Malpeque Bay, Prince Edward Island, and Shediac, New Brunswick;[334] from Cheticamp, Nova Scotia;[95] at Stephenville on the west coast of Newfoundland.[20] Abundant near Canso, Nova Scotia.[91] It occurs sparingly in the lower Bay of Fundy.[205]

BIOLOGY AND ECONOMICS: As Atlantic saury are only found in Canadian waters in summer and early autumn it is apparent that it is a migratory species that visits its northern outposts when the water is warmest.

Measurements of the Atlantic saury that are caught indicate that two distinct sizes are present, presumably a year apart in age. The species are fast growing with a life span of not more than 3 years.

The eggs of the Atlantic saury are spherical, about $\frac{1}{12}$ inch in diameter, and covered with filaments although not adhesive. The fry have not been caught in northern waters but are abundant between 11° and 40°N lat. There is no indication that the species spawn off the Canadian coast. It is interesting to note that the jaws do not reach their full length until the fish are from 4 to 6 inches long.

The food of the Atlantic saury consists chiefly of copepods and other minute crustaceans; small fishes have been found in their stomachs.

The species is pursued by tuna, mackerel, and pollock and is probably preyed upon by other species. They swim in schools and often leap from the water in great "cascades" to escape enemies.

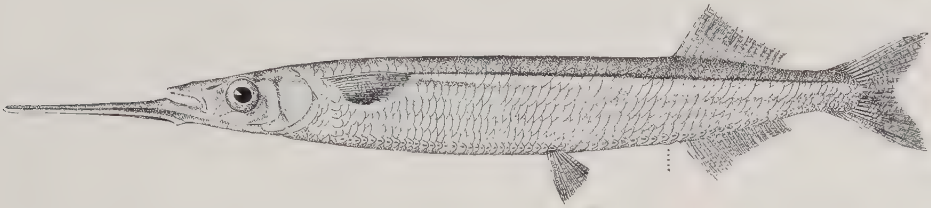
While the Atlantic saury is erratic in its occurrence in Canadian waters, in certain years quantities of 10,000–15,000 pounds have been available from single trap catches in St. Margaret's Bay. They are delicious when canned but the irregularity of supply has prevented a continuance of this use. Some canning was done between 1946 and 1948.

Family HEMIRAMPHIDAE — Halfbeaks

Common halfbeak — Balourou

Hyporhamphus sp.

DESCRIPTION: Body elongate, moderately compressed, depth 7–10 in length, tapering slightly towards head and tail. Head 3 in total length; upper jaw short, lower jaw prolonged into a beak that is half total length of head (including lower jaw); teeth weak. Eye large, 9 in total length of head, its diameter about equal to interorbital space. Fins: dorsal (1), 14–16, situated far back, originating above vent, longer than high; caudal moderate, lunate; anal, 15–17, situated under and slightly behind dorsal, similar in size and shape to dorsal; pectorals high on sides, short distance behind operculum, triangular, larger than pelvics; pelvics midway between opercle and base of caudal. Scales large.



Colour, translucent bottle-green above with silvery tinge; narrow silvery band on each side running from pectoral fin to caudal fin; tip of lower jaw reddish; three narrow dark streaks along middle of back; anterior rays of dorsal and anal fins and tip of caudal dusky.

DISTINCTIONS: The halfbeak is readily distinguished by its very long lower jaw, shorter upper jaw and the absence of detached finlets between the dorsal and caudal fins and between the anal and caudal fins. The dorsal and anal fins are located far back on the body and have even margins, without great differences in fin ray lengths.

SIZE: The maximum length of the halfbeak is about 12 inches.

RANGE: Coasts of tropical and subtropical America, rarely straying north of Cape Cod; several strays reported from Gulf of Maine.[49, 398]

Canadian distribution: There is a single Canadian record of the halfbeak. One was caught in a herring weir at Chamcook, Passamaquoddy Bay, New Brunswick, September 30, 1949, and was recorded as *H. roberti*, a synonym for *H. unifasciatus*.

Family EXOCOETIDAE Flyingfishes

The flyingfishes cannot be said to be regular members of the Canadian Atlantic fauna for there appear to have been only two records, presumably of different species, in over 100 years. Matthew Jones, in his List of the Fishes of Nova Scotia, published in 1882, noted that a species of "*Exocaetus* . . . Flyingfish" was taken at Sable Island in 1859 but the species was not identified. Numerous authors have repeated this record of the flyingfish off Sable Island but all seem to originate from Jones' 1882 statement. Halkett[184] listed three species of flyingfishes, *Exocoetus volitans* Linnaeus, *Exonautes vinciguerrae* Jordan and Meek, and *Cypselurus heterurus* Rafinesque, all said to occur northward in the Atlantic to Newfoundland or Newfoundland Banks, and none apparently verifiable. It is, therefore, most important that any specimens of flyingfishes be sent to the Biological Station, St. Andrews, N.B., or to the Royal Ontario Museum, Toronto, so that the identity may be verified. It would not be surprising, if during warming trends, more flyingfishes were reported.

KEY to Family EXOCOETIDAE

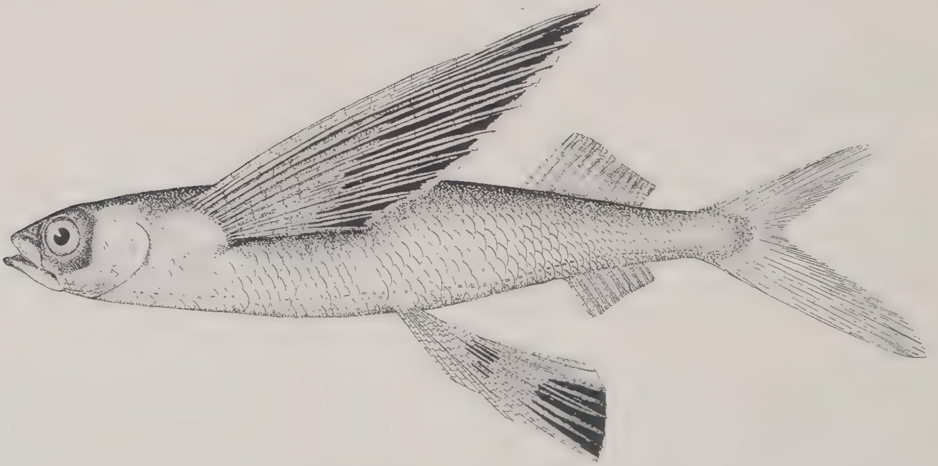
Lateral line scales 56–60; dorsal and anal fins pale; dorsal height about ½ dorsal base .... Atlantic flyingfish, *Cypselurus heterurus* (p. 171)

Lateral line scales 46; dorsal and anal fins with distinct spots; dorsal height greater than dorsal base .... Spotfin flyingfish, *Cypselurus furcatus* (p. 170)

Spotfin flyingfish   Exocet à nageoires tachetées

Cypselurus furcatus (Mitchill) 1815

DESCRIPTION: Body rather slender, compressed, depth 5¼ in length. Head 4½ in length, narrowed in front, snout rather pointed; mouth small, not reaching orbit, terminal but upturned; teeth small, without lateral cusps; 2 short barbels on lower jaw. Eye 3 in head, interorbital area flat. Fins: dorsal (1), 13, base about equal to length of head, longest rays about 1¼ times length of base, located far back on body, origin slightly in front of that of anal; caudal forked, lower lobe longer than upper and 3½ in body length; anal, 9, longest rays about half length of head, located under dorsal but shorter than dorsal; pectorals long and broad, tip of longest ray reaching 10th ray of dorsal, 1st ray simple, about half length of fin, 2nd ray divided, 3rd and 4th rays longest, origin of fin short distance behind and somewhat above gill opening; pelvics long, 2¼ in length of body, origin midway between posterior margin of eye and base of caudal, reaching slightly beyond anal. Scales, about 46 in line on side.



Colour, brownish above, silvery below; pectorals blackish with a broad diagonal white, or transparent band; pelvics black, except two outer rays, their axils black, dorsal fin, when depressed, showing three black spots; caudal has three dark transverse bands; a black spot on tips of 3rd to 6th rays of anal fin.

DISTINCTIONS: Flyingfishes may be distinguished by the herring-like body, with very long pectoral and pelvic fins. They are distinguished from the flying gurnard by the single dorsal and by the deeply forked but unequally lobed caudal; the gurnard has 2 dorsal fins and a weakly concave caudal fin. The spotfin flyingfish is separated from other flyingfishes by the barbels on the lower jaw, by the single-cusped teeth and by the white or transparent cross bars on the pectoral and pelvic fins.

SIZE: Up to 7 inches in length.

RANGE: Warm seas north to Cape Cod and the Mediterranean. Occasionally straying farther north.

Canadian distribution: There appears to be only one record. A specimen, 7 inches in total length, was caught in a trap in Northwest Cove, St. Margaret's Bay, Nova Scotia, August 27, 1951.

These fish, with the aid of their pectoral and pelvic fins, can plane through the air after leaping from the water. In this way they sometimes land on the decks of vessels that may carry them beyond their normal range. Inquiry in the present instance indicates that the capture of the specimen in St. Margaret's Bay was genuine, for the specimen was identified by Dr C. M. Breder, who commented that the mandibular barbels were missing.

Atlantic flyingfish **Exocet atlantique**

Cypselurus heterurus (Rafinesque) 1810

DESCRIPTION: Body rather slender, compressed, depth 5⅓ in length. Head 4⅔ in length, snout bluntly pointed; mouth terminal, small, not reaching front of orbit; teeth small, with 3 distinct cusps; 2 short barbels on lower jaw in young, these disappear at a length of 3½ inches. Eye large, about 3 in head. Fins: dorsal (1), 13–14, longest rays about half length of base, base about equal to length of head, located far back on body; caudal deeply forked, lower lobe longer than upper; anal, 8–10, base ⅗ length of base of dorsal, its origin under middle of dorsal; pectorals very long, reaching last rays of dorsal, their width about ¼ their length, inserted high on sides, a short distance behind upper part of gill opening, first ray simple, second ray divided, 3rd and 4th rays longest; pelvics inserted about midway between pupil of eye and base of caudal, slightly over half the length of the pectorals, a little longer than head and not reaching beyond anal fin. Scales, 58 in line on side.

Colour, darkish above and silvery below, dorsal fin uniformly grayish; caudal, gray with darker streaks; pectorals uniformly grayish with a slightly lighter cross band and a narrow, light, outer margin.

DISTINCTIONS: Distinguished as a flyingfish by the characters that are listed for the spotfin flyingfish. It can be separated from the latter by the tricuspid teeth, by its narrower pectoral fin and by its low and uniformly coloured dorsal fin; the spotfin has a high dorsal with black markings.

SIZE: This flyingfish reaches a length of 1 foot.

RANGE: Found in the warmer parts of the Atlantic Ocean, straying north to Cape Cod and the Newfoundland Banks; and to Norway, where a single specimen was taken in Oslofjord.[370]

Canadian distribution: Although no details are given this species is reported as straying north to the Newfoundland Banks.[231, 336] An unidentified specimen of flyingfish was taken at Sable Island in 1859 and may have been this species.[49, 232, 513]

Order MICROCYPRINI (Cyprinodontiformes or Cyprinodontes)
KILLIFISHES

These are small fishes of wide distribution in the salt and fresh waters of North and Central America. All are soft-rayed, pectoral fin elevated on side, dorsal fin usually in a posterior position on back, pelvic fins are abdominal in position when present, scales cycloid, and the air bladder is without a duct to the gut. The killifishes are of particular interest since many species in this order bear living young, particularly the well-known aquarium species, such as guppies and swordtails of the family Poeciliidae. The order contains about 400 species, classified in 8 families. Only two species occur in the Canadian area.

Family CYPRINODONTIDAE — Killifishes

KEY to Family CYPRINODONTIDAE

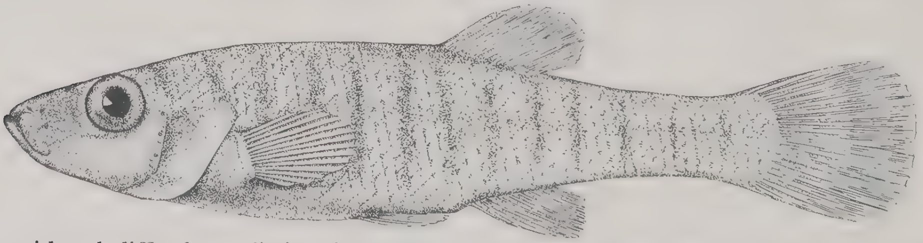
Gill rakers usually 5, widely spaced and obvious; distance from origin of dorsal to end of vertebral column, stepped forward from dorsal fin origin, reaches a point about middle of eye ..... Banded killifish, *Fundulus diaphanus* (p. 172)

Gill rakers usually 9 or more, crowded and not obvious; distance from origin of dorsal fin to end of vertebral column, stepped forward from dorsal fin origin, reaches posterior half of operculum .... Mummichog, *Fundulus heteroclitus* (p. 173)

Banded killifish — Petit barré

Fundulus diaphanus (LeSueur) 1817

The banded killifish is not to be regarded as a marine species but rather as a freshwater form that is salt tolerant (euryhaline) to a degree and may be found in brackish waters in association with the mummichog, *F. heteroclitus*. Although often considered difficult to distinguish from this latter species, there are many features that make identification relatively easy. The gill raker counts, 4–6 for *F. diaphanus* and 8–12 for *F. heteroclitus*, are particularly useful.[427]



The occurrence of *Fundulus diaphanus* in the St. George Bay region of Newfoundland suggests that the species is capable of surviving exposure to normal Gulf salinities since the nearest known populations are across the Gulf in Prince Edward Island and neighbouring provinces.

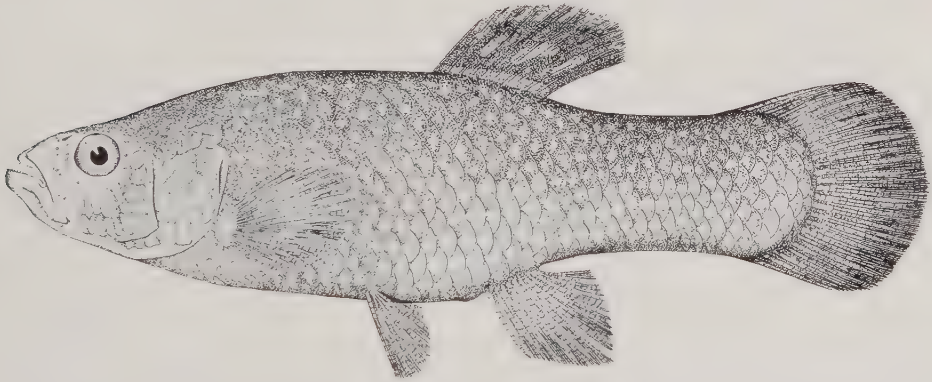
Mummichog **Choquemort**

Fundulus heteroclitus (Linnaeus) 1766

OTHER COMMON NAMES: common killifish, salt water minnow

DESCRIPTION: Body stout, broad anteriorly, compressed posteriorly, depth slightly less than 4 in length; caudal peduncle robust and deep. Head 3–3⅔ in length, blunt, broad and flat on top; mouth terminal with lower jaw projecting slightly, short, gaping only half distance from snout to eye; each jaw with a narrow band of pointed teeth. Eye moderate, 5 in head, about equal to snout. Fins: dorsal (1), 11, longer than high, originating midway between snout and tip of caudal; caudal fully rounded; anal, 10–11, located just behind vent and under dorsal fin, middle rays longest; pelvic fins low on body, moderate, located about halfway between base of pectoral and front of anal; pectorals on sides, behind gill opening, larger than pelvics. Scales large, 35–38 rows; scales on upper parts of head. No lateral line.

Colour, males are dark, dull-green on back and sides, belly more or less orange-yellow, sides with numerous ill-defined silvery bars and with irregularly distributed white and yellow spots, front edges of pelvic and anal fins yellow; females, plain olivaceous, lighter below, sides with about 15 indistinct crossbars. At spawning time the pigmentation of the male becomes intensified and the yellow becomes more brilliant.



DISTINCTIONS: The mummichog may be distinguished by its stout body, deep caudal peduncle and rounded tail, combined with having a soft-rayed dorsal fin, situated far back, above the anal, and pelvic fins that are abdominal in position.

SIZE: The maximum length is between 5 and 6 inches.

RANGE: Coast of North America from the Gulf of St. Lawrence to Texas; in estuaries and brackish tide pools.

Canadian distribution: The most northeasterly record for the mummichog is from Port au Port

Bay, Newfoundland.[228, 427] It is reported from Anticosti Island, the Magdalen Islands, and from many shore points from Gaspé to Cape Breton. It occurs along the shore of Halifax County, Nova Scotia,[268] and doubtless at many other points on the outer coast of Nova Scotia; in the Bay of Fundy it occurs in estuaries including those of the Sissiboo, Annapolis, Saint John, and Shubenacadie rivers. It is restricted to brackish pools and marshy places and is not found in the open sea.

BIOLOGY AND ECONOMICS: Mummichogs live in situations where they are likely to be trapped by tidal movement, or by the drying up of small pools. They are very tolerant of extremely low oxygen conditions and can survive in stagnant water for long periods. They winter in holes in tidal streams and have been found buried in the mud at such times. There is no evidence that they migrate appreciably.

Spawning occurs in shallow water in midsummer. The eggs are spherical, about $\frac{1}{12}$ inch in diameter and they adhere in masses to any object on bottom with which they come in contact. Hatching occurs in 9–18 days depending on temperature.

Mummichogs eat a variety of animal and vegetable food. Diatoms, eelgrass, small Crustacea (shrimp and amphipods), small molluscs and small fishes have been found in their stomachs.

Mummichogs are used to some extent as live bait by trout fishermen and other sport fishermen. Because of their hardiness these fish can be shipped conveniently to distant places for such use.[268] They are known to this trade as “salt water minnows.” This same hardiness makes the mummichog useful as a laboratory animal and some are used in this way.

Order SOLENICHTHYES

SEAHORSES AND RELATIVES

This order embraces some of the most peculiar of all fishes, the well-known seahorses, plus the pipefishes, snipefishes, cornetfishes and tubesnouts. All of these are fishes of shallow, warm seas in tropical, subtropical, or temperate marine waters, some forms invading brackish areas.

The fishes in the order are characterized by having soft rays in the fins, the pelvic fins are abdominal in position, the air bladder without a duct to the gut, and mouth usually located at end of a produced or elongated snout. Some species may have a spinous dorsal fin. The fishes of this order are of additional interest because of their unusual breeding habits. Among the seahorses and pipefishes the eggs are laid by the female in a brood pouch on the abdomen of the male where they incubate, eventually emerging from the pouch fully developed and able to take care of themselves.

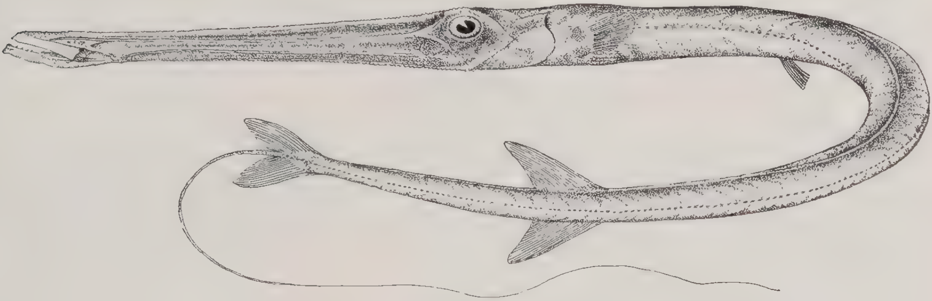
Although some 150 species in about seven families have been described, only three species in two families, Fistulariidae and Syngnathidae, occur in the Canadian Atlantic region.

Family FISTULARIIDAE — Cornetfishes

Cornetfish — **Fistulaire tabac**

Fistularia tabacaria Linnaeus 1758

Description: Body very elongate and slender, depressed, broader than deep, depth 30–35 in total length (excluding caudal filament). Head very long, 3 in total length; snout very long, tubular; mouth terminal, slightly oblique, small, lower jaw projecting, with minute teeth. Eye 14 in head, placed back ¾ of length of head. Fins: dorsal (1), 14, triangular, higher than long, height of longest rays equalling length between posterior edge of eye and gill opening, situated back ¾ of distance between eye and base of caudal fin; caudal forked, but with middle rays prolonged into a filament that almost equals length of head; anal, 13, under and almost identical in size and shape with the dorsal; pectorals moderate, rounded, located on sides a short distance behind gill opening; pelvics small, located back about ⅓ of distance between eye and caudal. Body scaleless but with embedded bony plates. Lateral line distinct.



Colour, reddish to greenish-brown above with numerous large, oblong, pale-blue spots on sides and back; caudal filament blue.

Distinctions: The cornetfish is distinguished by its slender form and extremely long snout, with a small, terminal mouth. The caudal filament is also diagnostic, if not broken off. It further differs from the pipefish by having pelvic fins.

Size: Up to 6 feet in length; specimens that stray northward are small.

Range: Tropical seas off eastern America from Long Island to Brazil. Occasionally straying to Massachusetts, Georges Bank, and Nova Scotia.

Canadian distribution: Only a few specimens are recorded. One, measuring 31 inches including caudal filament, was taken at Portuguese Cove, Halifax Harbour, in September 1863 and other specimens were known from inshore Nova Scotian waters in summer.[232] More recently one, 19 inches long including filament, was caught at Port Mouton, N.S., in Septmber 1931.[498] Another specimen was reported from Burin, Nfld., in September of the same year.[17]

KEY to Family SYNGNATHIDAE

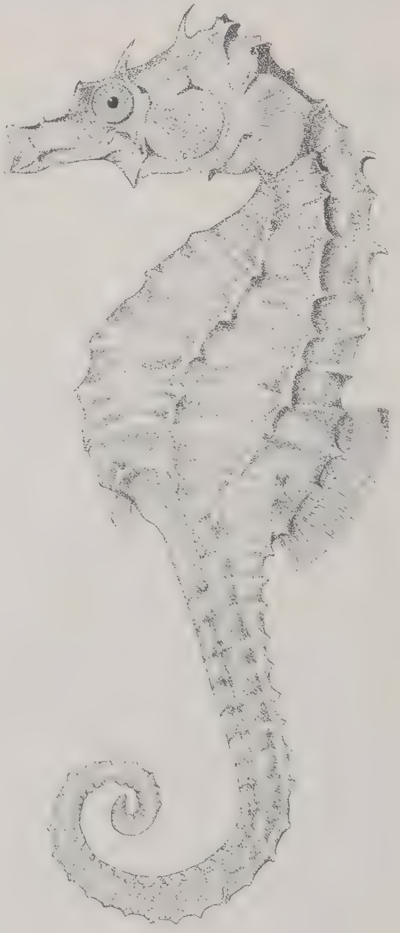
Head oriented at right angle to body; no caudal fin; body tapering to a point and often curled like a watch spring .... Spotted seahorse, *Hippocampus erectus* (p. 176)

Head in line with body; no caudal fin; body tapering to a point but not curled .... Northern pipefish, *Syngnathus fuscus* (p. 177)

Spotted seahorse — Hippocampe moucheté

Hippocampus erectus Perry 1810

Description: General appearance resembling a chess knight; body strongly compressed, belly deep, about equal to length of head; tail much more slender, gradually tapering to a four-cornered, curled, prehensile tip. Head at a right angle or more to the body; mouth at end of tubular snout, small; weak spines on head, one above eyes and one near top of head; an occipital crest surmounted by an angular, star-shaped coronet. Eye 6 in head. Fins: dorsal (1), 19, uniform in height, base covers 3½ body plates, 2½ times as long as high, situated about middle of body, ending over vent; caudal none; anal very small, oposite hind part of dorsal; pectorals moderate, broad, rounded, situated on curved part of body just behind head; pelvics none. Body and tail covered with rings of interlocking bony plates, 12 rings on the trunk, 32-35 on the tail, each body ring with 4 blunt spines. A brood pouch in males on under side behind vent, has small opening near its front end; only prominent at spawning time.[391]



Colour, light-brown or dusky to light-gray or yellow, variously mottled; probably able to alter colouration to suit environment.[49]

Distinctions: The seahorse cannot be mistaken because its peculiar head, set at an angle to the body, occurs in no other species; only one species occurs in this area. The prehensile tail, lacking a caudal fin and the bony plates covering the body are further distinguishing marks.

Size: Up to 7 inches in length.

Range: Confined to the Atlantic coast of North America from Cape Cod to North Carolina, occasionally straying to the coasts of Maine and Nova Scotia.[400b]

Canadian distribution: Reported vaguely off Nova Scotia many years ago.[232, 246] More definitely from 3 miles south of Mar's Rock, near Halifax Harbour, N.S., in September 1934; the 3-inch specimen, taken there, did not agree completely with the description of this species.[498] Another specimen was caught by the S.T. *Cape Agulhas* a short distance northeast of Sable Island.[17]

BIOLOGY AND ECONOMICS: Seahorses live among eelgrass and seaweed, sometimes adrift, usually clinging to it with their prehensile tails. They swim by means of the dorsal fin, the fish maintaining an upright position; the interlocking plates prevent much lateral movement of the tail.

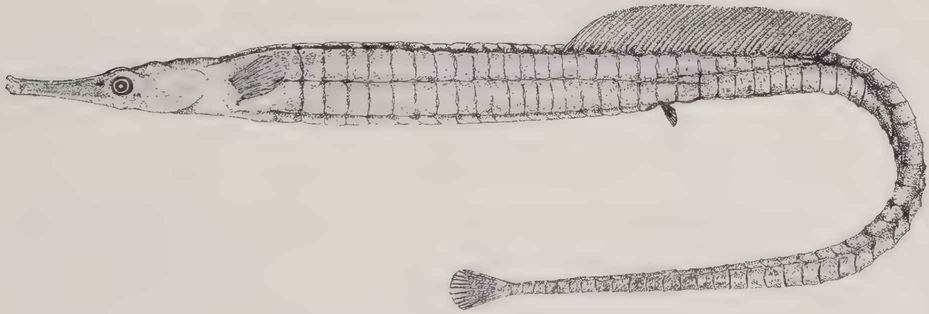
The seahorse feeds on small copepods, amphipods and other Crustacea that are drawn into the mouth by sucking action.

They breed in summer. The female transfers the eggs (up to 150) into the brood pouch of the male. They hatch there and the young are retained until the yolk sac is absorbed.[160]

Northern pipefish **Syngnathe brun**

Syngnathus fuscus Storer 1839

DESCRIPTION: Body elongate, very slender, depth 30–35 in total length; hexagonal in cross-section in front of vent, changing to 4-sided behind dorsal fin; 18–20 rings of bony plates in front of vent and 36–42 behind vent; dorsal keels present, those of body and tail not continuous, lateral keels from tip of pectorals to beginning of dorsal. Head 8 in total length; snout produced in a tubular form with a small, toothless, terminal, mouth; end of snout blunt. Eye 7 in head, high on side of head, behind its middle. Fins: dorsal (1), 35–41, rays one-seventh of head length, fin slightly shorter than head, situated above vent and near middle of body; caudal small, rounded; anal, minute, immediately behind vent, absent in male; pectorals situated on sides behind gill opening, length 4 in head; pelvics absent. No lateral line. Two longitudinal folds of skin on under part of abdomen from vent to about mid-point of tail form a brood pouch in the male only, the folds meeting in the midline.



Colour, greenish, brownish, or olive above, cross-barred and darkly mottled; lower parts of sides sprinkled with white dots; under surface from head to vent golden-yellow; brood pouch flaps flesh-colour; dorsal and pectoral fins pale; caudal fin brown. The colour may change to suit surroundings.[49]

Distinctions: The northern pipefish is distinguished by the slender, armoured body, tubular snout and by the absence of pelvic fins. The head is much shorter than that of the cornetfish. Males are distinguished by the presence of a brood pouch under the abdomen. Internally the gills consist of tufts of small, rounded lobes, instead of gill filaments.

Size: Up to 12 inches in length, but rarely over 8 inches.

Range: From the southern Gulf of St. Lawrence to South Carolina in coastal waters.

Canadian distribution: Taken in Miramichi Bay.[93] Common in inner part of Malpeque Bay, P.E.I.[334] The only positive record for the outer coast of Nova Scotia is from Dingwall,[95] although they are stated to be common in all warm shore areas of Nova Scotia.[232, 513] Reported from Passamaquoddy Bay, Annapolis Basin, and Cobequid Bay in the Bay of Fundy.[205]

Biology and Economics: Northern pipefish live among seaweed and eelgrass in warm-water coastal areas, sometimes in brackish inlets, and only rarely any distance out to sea. They swim chiefly by means of the dorsal fin, but when alarmed the caudal fin and tail are used. They feed on minute copepods, amphipods, fish eggs and fish larvae, and probably any other available small organisms.

The female transfers the eggs to the brood pouch of the male, where they are fertilized and develop, being released when they hatch. Males carrying eyed eggs have been found in Cobequid Bay in August; larvae $\frac{3}{4}$ inch long, have been found free there at the same time.[263] This agrees with the view that they spawn in June and July in Long Island Sound.[520]

Order THORACOSTEI (Gasterosteiformes)

STICKLEBACKS

This is a small order of little fishes, the largest of which may barely exceed 6 inches in length. They are primarily marine species but some forms have successfully invaded fresh waters. Characteristically, they have a swimbladder without a duct to the gut, the dorsal, anal, and pelvic fins normally equipped with sharp spines, and the pelvic fins are thoracic in position.

One family and four species occur in our area.

Family GASTEROSTEIDAE — Sticklebacks

The sticklebacks are small spiny-rayed fishes in which the soft dorsal fin is preceded by 2 to 10 or 11 isolated spines, each connected to the dorsal surface by its own triangular-shaped membrane; the last dorsal spine more or less closely associated with front of soft dorsal fin. The pelvic fins are subabdominal each with a well-developed spine and one or two rudimentary soft rays. Associated with the pelvic fins is a posteriorly directed bony plate (or plates). Some forms have bony plates arranged along the sides, especially when living in salt water.

Sticklebacks exhibit great variation in the number of bony body plates, vertebrae, and fin rays.

The group has a wide range of salinity tolerance, some species being restricted entirely to fresh water (*Eucalia inconstans*), some to salt water (*Gasterosteus wheatlandi*), while others are established in both fresh and salt water (*Gasterosteus aculeatus*).

Sticklebacks have been widely used in behavioural and distributional studies and in studies designed to determine the effect of such environmental factors as temperature and salinity on fin and vertebral development.

The family is restricted to the cool waters of the northern hemisphere. Although a large number of species have been described, about 12 are now considered valid.

Four well-defined species occur in the Canadian Atlantic area.

KEY to Family GASTEROSTEIDAE

1 Dorsal spines usually 9 (7–12), short and inclined alternately to left and right; gill membrane entirely free from isthmus; a median ventral plate present; no bony plates on sides .... Ninespine stickleback, *Pungitius pungitius* (p. 184)

Dorsal spines 3–6; gill membrane united to isthmus; usually bony plates along side and between pelvic fins (except in *A. quadracus*) 2

2 Dorsal spines 4 or 5 (rarely 6), last spine attached to soft dorsal, spines inclined alternately to left and right side; a bony stay directed posteriorly from base of each pelvic fin; no median ventral plate .... Fourspine stickleback, *Apeltes quadracus* (p. 179)

Dorsal spines 3 (rarely 4), last spine not attached to soft dorsal, all spines in line; a strong median ventral plate extending posteriorly from pelvic base 3

3 Dorsal spines 3 (rarely 4), last spine, short; pelvic fin of one spine and one soft ray, spine with one pointed cusp at base; caudal peduncle with a keel; body without round black spots; colour in life green, blue, or silvery .... Threespine stickleback, *Gasterosteus aculeatus* (p. 181)

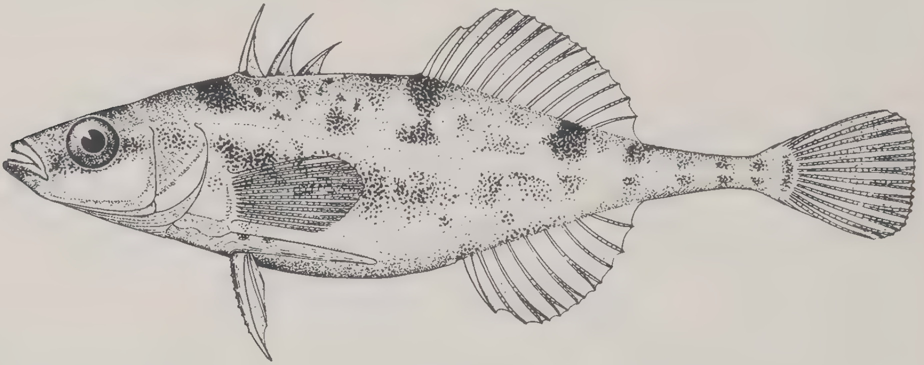
Dorsal spines 3 (rarely 2); pelvic fin of one spine and 2 soft rays, spine with 2 well-developed pointed cusps at base; caudal peduncle keelless; many round black spots along sides; colour in life lemon-yellow .... Blackspotted stickleback, *Gasterosteus wheatlandi* (p. 182)

Fourspine stickleback — Épinoche à quatre épines

Apeltes quadracus (Mitchill) 1815

Other common names: bloody stickleback, pinfish

Description: Body moderately elongate, somewhat compressed; greatest depth occurs between dorsals, ratio in total length 5.0–6.0; caudal peduncle slender, without keel; a ridge on each side of lower abdomen behind pelvic fins due to separate innominate bones but no bony plate between pelvics; cross-section of body somewhat triangular. Head pointed, compressed, 3.8–4.5 in total length, gill membranes broadly united to isthmus; mouth small, terminal, lower jaw projecting slightly; a single series of slender teeth in each jaw. Eye 3.0–4.0 in head. Fins: soft dorsal preceded by 3 or 4 isolated spines plus one spine attached to the anterior edge of the soft dorsal; first 3 or 4 spines inclined to left or right (as in *P. pungitius*), first and second spines about equal and about 3 in head, third and fourth about ½ length of first; total dorsal spine count 4 or 5 rarely 3 or 6;[250] soft dorsal fin rays 11 (range 10–13), fin origin about mid-point of body slightly in advance of anus; caudal fin truncate with rounded corners; anal, I, 9 (range 8–10) spine attached by membrane to anterior edge of fin, equalling last dorsal spine, fin terminating under posterior end of soft dorsal; pectorals moderate, inserted on sides a short distance behind gill opening, ½ length of head, rounded; pelvics, I, 2, the spine heavy, lightly serrated, about ½ length of head, the two soft rays slender; vertebral count 32, ranging from 31–34; skin naked, without scales or bony plates. Lateral line present but not obvious.



Colour brownish-olive above, mottled with darker; silvery below; males may be almost black; pelvic spine and membrane red on ripe males.

Distinctions: The fourspine stickleback can be distinguished by 4 or 5 irregular and inclined dorsal spines and by the fact that the spines immediately in front of the second dorsal and anal fins are attached by membrane to the soft rays. In the other species spines are separate from the soft rays of the fins. The gill membranes are broadly united to the isthmus. The brownish body pattern is also distinctive.

Size: Up to 2½ inches in length.

Range: Confined to coastal waters of eastern North America, sometimes in fresh water; from the Gulf of St. Lawrence and Newfoundland southward to Virginia.

Canadian distribution: The most northerly record is from Gaspé Basin, Que.[229] Reported from Newfoundland, Port au Port and Placentia Bay region.[127] Elsewhere in the Gulf of St. Lawrence it is reported as common at the Magdalen Islands;[95, 140a] the Miramichi estuary;[312] Malpeque Bay, P.E.I.;[334] East Lake, P.E.I.;[140a] Cape Breton.[95] Common in brackish ponds near Canso, N.S.[91] In the estuaries of Passamaquoddy, St. Mary and Kennebecasis bays.[205] Saint John Harbour.[93] It occurs in fresh water in many parts of Nova Scotia.[263, 268]

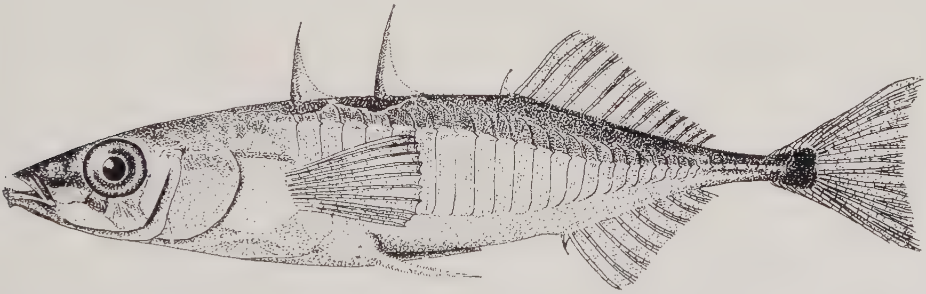
BIOLOGY AND ECONOMICS: The fourspine stickleback is usually found in salt or brackish waters, but, as noted above, does occur in some instances in fresh water as much as 15 or 20 miles from the nearest brackish water particularly in Nova Scotia. Its habits resemble those of the other sticklebacks; it spawns in late spring or early summer; the males build nests in which the eggs are laid and guarded.

Threespine stickleback — Épinoche à trois épines

Gasterosteus aculeatus Linnaeus 1758

OTHER COMMON NAMES: twospine stickleback, spantickle, pinfish

DESCRIPTION: Body rather stout, compressed, caudal peduncle slender and depressed, usually with a lateral keel; body depth 4.5–5.0 in total length; a variable number of bony plates on each side, up to 30 or more in specimens from salt water, fewer or none on specimens from fresh water; a single ventral bony plate on the lower surface, between and behind the pelvic fins. Head 3.8–4.2 in total length, compressed, gill membranes broadly joined to isthmus; mouth small, lower jaw projecting, teeth in jaws minute, sharp; gill cover finely striated. Eye 4 in head. Fins: soft dorsal preceded by 3, rarely 4, isolated and serrated spines, each with a triangular fin membrane, length of longest spine variable but usually 2.0–3.0 in head length, last spine very short, not attached to soft dorsal; soft dorsal with 12 rays (range 10–14), origin slightly in advance of anus; caudal fin moderate, truncate; anal I, 8–10, spine slightly shorter than last dorsal spine, lightly serrated and free from soft rays, origin of fin behind that of soft dorsal, terminating under end of soft dorsal; pectorals large, over ½ length of head, inserted on sides a short distance behind gill opening; pelvic with one soft ray and a single strong spine, slightly longer than any dorsal spine, situated on ventral edge under middle of pectorals. All spines can be locked in erect position. Lateral line high. A very variable species as to spine lengths, soft fin rays, amount of mail on sides and development of keel on caudal peduncle.



Colour, variable above, gray, olive, greenish-brown, or blue, on spawning males the eyes also are blue; belly silvery; fins pale but fin membranes often red. Red tints develop ventrally in breeding season, most pronounced in males; females assume brassy reflections on sides as well.

DISTINCTIONS: The 3 dorsal spines, all in line and all independent of each other, identify this fish as a stickleback. The spine immediately in front of the soft dorsal is free from it; in the fourspine stickleback it is attached to the soft dorsal. The gill membrane is narrowly united to isthmus. The pelvic fins are under the middle of the pectorals in the threespine and under the origin of the pectorals in the fourspine sticklebacks.

SIZE: Maximum length 4 inches; not usually over 3 inches long.

RANGE: Circumpolar along the coasts and in fresh water in the Northern Hemisphere. From Hudson Bay and Baffin Island to Chesapeake Bay and Lake Ontario; from British Columbia to southern California. South Greenland; Iceland; Norway to Spain. In northern Asia.

Canadian distribution: Hudson Strait; Wakeham Bay.[496] Baffin Island.[538] Abundant in Ungava Bay and its rivers.[124, 538] On the Labrador coast at many points from Nain Bay to the Strait of Belle Isle; in Hamilton Inlet.[25] Reported in Newfoundland from Pistolet Bay,[209] off Bay of Islands;[18] in Placentia Bay;[17] in Port-au-Port Bay and at Kelligrews.[228] In the Gulf of St. Lawrence from Trois Pistoles, Que.;[514] from Anticosti;[405] from Gaspé; [229, 450] from the Magdalen Islands;[95, 140a] from the Miramichi estuary;[312] extremely numerous in Malpeque Bay, P.E.I.;[334] near Charlottetown, P.E.I.;[140a] at Tignish, P.E.I.[92] Abundant near Aspy Bay, N.S.[95] and at Canso, N.S.[91] Reported at Yarmouth and St. Mary Bay, N.S., Passamaquoddy Bay, Saint John Harbour and Kennebecasis Bay, N.B.[205] In fresh water in lakes and in the upper Saint John, Madawaska, and Restigouche rivers in New Brunswick.[93] In Lake St. John, Saguenay County, Que.[262] Throughout Nova Scotia.[268] In rivers entering James Bay;[538] the St. Lawrence River, tributaries of Lake Ontario and parts of the Gatineau River near Hull, Que.[369] Recorded from British Columbia waters.[82]

BIOLOGY AND ECONOMICS: This stickleback, like its close relatives, is a shore fish, but it is equally at home in fresh or salt water. It does stray from land occasionally, apparently keeping near the surface around floating seaweed or other debris. It spawns in fresh water, where the male builds a nest, that it later defends until the fry are able to fend for themselves. Spawning occurs in June or July.

In Europe studies of the otoliths have indicated that the threespine stickleback has a life expectancy of 3–3½ years, and attains sexual maturity during the first year.[233]

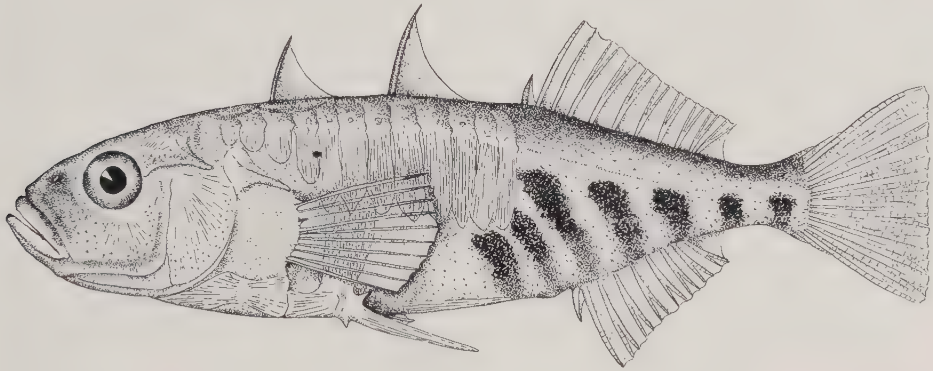
A pugnacious fish, it feeds on copepods, isopods, euphausiids, and other small invertebrates in the sea; in fresh water it eats small fishes and fish eggs in addition to any small invertebrates that are available.[49]

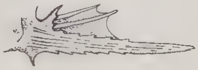
Blackspotted stickleback Épinoche tachetée

Gasterosteus wheatlandi Putnam 1867

OTHER COMMON NAMES: twospine stickleback, épinoche à deux épines

DESCRIPTION: Body rather stout, compressed, caudal peduncle slender, without lateral keel; depth 4.0–5.0 in total length; up to 6 bony plates anteriorly on sides, none on posterior part of body; a single ventral bony plate on lower surface, between and behind the pelvic fins; a lateral plate extending dorsally from anterior base of pelvic fins. Head 3.5–4.5 in total length, compressed, gill membranes broadly joined to isthmus; mouth small, lower jaw projecting, teeth on jaws minute, sharp. Eye 3.0–3.5 in head. Fins: soft dorsal fin preceded by 3 isolated and lightly serrated spines, each with a triangular membrane; first two long, third very short and immediately in advance of soft dorsal but not attached to it, second dorsal spine usually longest, 2.0–3.0 in head length; soft dorsal of 9 (occasionally 10) rays, longest in front and about equal to length of second dorsal spine, origin immediately over anus; caudal fin moderate, truncate or square. Anal, I, 7 (sometimes 6) spine equal or shorter than third dorsal spine and strongly curved and joined to anal fin, origin behind that of soft dorsal and terminating below end of soft dorsal; pectorals large, over ½ length of head, inserted on sides a short distance behind gill opening; pelvics I, 2, spine strongly serrated and with strong basal cusps on each side, these pointed cusps situated dorsally and ventrally at base of spine. All spines can be locked in erect position. Lateral line high.





Colour characteristically yellow or greenish-yellow, particularly conspicuous on spawning fish; sides with dark spots that persist after preservation, belly silvery. Spawning males have orange pelvics.

DISTINCTIONS: The two isolated dorsal spines and the independent spines of the soft dorsal and anal fins identify this fish as *Gasterosteus*. It is distinguished from the more common threespine stickleback by the presence of strong basal cusps on the pelvic spines; by two soft rays in the pelvic fin as compared with one or none in the threespine; there are fewer soft dorsal and anal rays than in the other species; there are fewer plates on the sides than on the threespine stickleback when living in salt water, and no keel on the caudal peduncle. The yellowish green colouration, with sharply contrasting black spots, so prominent on spawning fish, will aid in field identification.

SIZE: Up to 3 inches in length.

RANGE: The blackspotted stickleback is restricted to marine coastal localities in eastern North America from Newfoundland to Massachusetts.

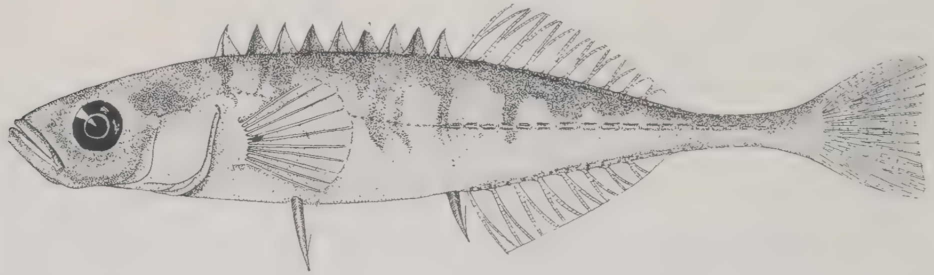
Canadian distribution: Probably not always distinguished from the threespine stickleback. It has been reported from Port au Port Bay, Nfld.,[97] and from Passamaquoddy and St. Mary bays.[49, 205]

BIOLOGY AND ECONOMICS: The habitat of this species is almost strictly marine; it often leads a semi-pelagic existence, especially near floating seaweed; it sometimes penetrates into brackish water but is not known in fresh water.[199] The species is so frequently confused with the threespine stickleback that little is known of its life history or habits.

Ninespine stickleback — Épinoche à neuf épines

Pungitius pungitius (Linnaeus) 1758

DESCRIPTION: A small fish with a slender, compressed body, tapering to a very slender caudal peduncle that is broader than deep; usually, but not always, with a strong keel on each side of caudal peduncle; greatest depth 6½ in total length; small bony plates confined to bases of dorsal and anal fins and on caudal keel; a single small bony plate on ventral surface between and behind the pelvic fins. Head about 4 in total length, gill (or branchiostegal) membranes entirely free from isthmus but united; mouth small, oblique, lower jaw projecting slightly, lips fleshy. Eye large, 3.5–4.5 in head. Fins: soft dorsal, preceded by 9 (7–12) short, isolated, backwardly directed spines, each with a triangular fin membrane, spines of nearly uniform height (last spine slightly larger) usually 1.0–1.5 mm long and inclined alternately to left or right, beginning above gill opening and extending backward to soft dorsal; soft dorsal with 10 or 11 rays, first rays double the height of the spines, tapering off posteriorly; caudal rounded; anal, I, 8, situated under soft dorsal, the spine slightly longer than the dorsal spines; pectorals large, located on sides behind gill opening, extending to sixth dorsal spine; pelvics reduced to single, strong, spines, 3.0–4.0 in head, located under middle of pectoral fin; all spines can be locked in an erect position. Lateral line not prominent. Skin without scales.



Colour olive above, strongly pigmented, irregularly darkly barred; silvery below. Reddish tints appear during the breeding season, particularly about the head.

DISTINCTIONS: The 9 (7–12) alternately inclined short dorsal spines will serve to distinguish this species. Five is the largest number of spines in other sticklebacks in this area. In addition the gill membrane is entirely free from the isthmus.

SIZE: Up to 3 inches in length, but usually not over 2 inches.

RANGE: A widely ranging species in fresh and salt water in all northern countries including North America, Europe, and Asia. Confined to near shore in the sea.

From Alaska and the Arctic seas south to New Jersey, Minnesota, and Michigan. From northern Scandinavia to the Mediterranean and Black Sea.

Canadian distribution: It has been reported in salt or brackish water as follows: Cape Lambert, Cockburn Point, Bernard Harbour, and Langton Bay, N.W.T.[517] King William Island and Baffin Island;[124] James Bay, Cape Merry Peninsula (Hudson Bay), Hudson Strait, and Wakeham Bay;[496] Ungava Bay;[124, 240] Hamilton Inlet;[210] Sandwich Bay, Labrador;[17] Newfoundland;[150b] Port au Port Bay and St. Georges Bay, Nfld.[228] Reported as abundant from: Gaspé Peninsula;[229, 450] Miramichi estuary,[312] shores of Prince Edward Island;[140a, 334] Magdalen Islands, Que.;[140a] Cape Breton coast;[451] Canso, N.S.[91] In the Bay of Fundy known from brackish waters of Passamaquoddy Bay and St. Mary Bay.[205] Less abundant in Labrador waters than *G. aculeatus.*[25]

Widely distributed in fresh water. In the McKenzie River and Great Bear Lake.[538] In the Hudson Bay drainage (including Saskatchewan), all of the Great Lakes, except Lake Erie, and their drainages, the St. Lawrence River system,[201] and the Maritime Provinces; sparingly distributed in Newfoundland.

McPhail[315b] has postulated two origins of postglacial distribution—Mississippi Valley and an Alaskan-Siberian source. Canadian Atlantic populations are thought to have originated by a spread eastward across the Canadian arctic and southward on the Atlantic coast.

BIOLOGY AND ECONOMICS: The ninespine stickleback is tolerant of fresh and salt water, but spawns in fresh or slightly brackish water. Spawning occurs in summer; the male constructs a nest in which the female deposits the eggs; the male defends the nest against intruders. European studies reveal that the young grow very rapidly the first year, and although they may live for 3 or 3½ years, little growth is apparent after the first year. Rate of growth is determined by study of the otoliths.

Order ANACANTHINI (Gadiformes)

COD-LIKE FISHES

This is a rather widely distributed group of fishes, essentially marine but having one species distributed in the fresh waters of the northern parts of North America and Eurasia. Their origin and proper position in the classification of fishes has been discussed at length by many ichthyologists but the present-day opinion would relate the group to soft-rayed fishes and place them approximately in the same relative position as used here.

The Anacanthini are soft-rayed carnivorous fishes with long dorsal and anal fins, these often subdivided into 2 or 3 separate fins, the pelvic fins jugular, sometimes thoracic in position, and may be many-rayed or reduced to filaments, but are attached to the cleithra by ligaments only; scales cycloid, air bladder without a duct, and the upper jaw is bordered by the premaxillaries. In one family, the Macrouridae, the body tapers to a point and there is no caudal fin. In those forms with a caudal fin (such as Gadidae), its skeletal support is derived from the neural and haemal spines of the posterior vertebrae and the terminal vertebrae are reduced in size and not upturned.

The eggs of these fishes have an oil globule and are buoyant, those of the cods (Gadidae) float to the surface layers of the ocean and are, therefore, pelagic while the eggs of the deep-dwelling macrouroid fishes, although buoyant, do not float to the surface but remain suspended in the depths and hence are bathypelagic.

The Anacanthini are classified in five families and some 400 species. Three families and 29 species are known to occur in the Canadian region. The Macrouridae is the largest family with some 250 species, while the Gadidae or cod family contains at least 60 species, 19 of which occur in the Atlantic off the Canadian coast.

KEY to Genera of Order ANACANTHINI
(Families Moridae and Gadidae)

1 One (*Brosme* only), 2 or 3 dorsal fins; one or 2 anal fins; vomer usually toothed (Gadidae) 2
Two dorsal fins (base of first dorsal short, 2nd dorsal long); one or 2 anal fins; if one anal fin this often deeply divided; vomer usually toothless (Moridae) 14

2 One dorsal and one anal fin only, each joined to caudal and separated from it by a notch; median fins dark toward margin, with white edging .... genus *Brosme* (p. 191)
Two or 3 dorsal fins; one or 2 anal fins 3

3 Three dorsal fins; 2 anal fins 4
Two dorsal fins (first dorsal sometimes reduced to a single filament); one anal fin; (2nd dorsal and anal may be deeply notched as in *Merluccius*) 9

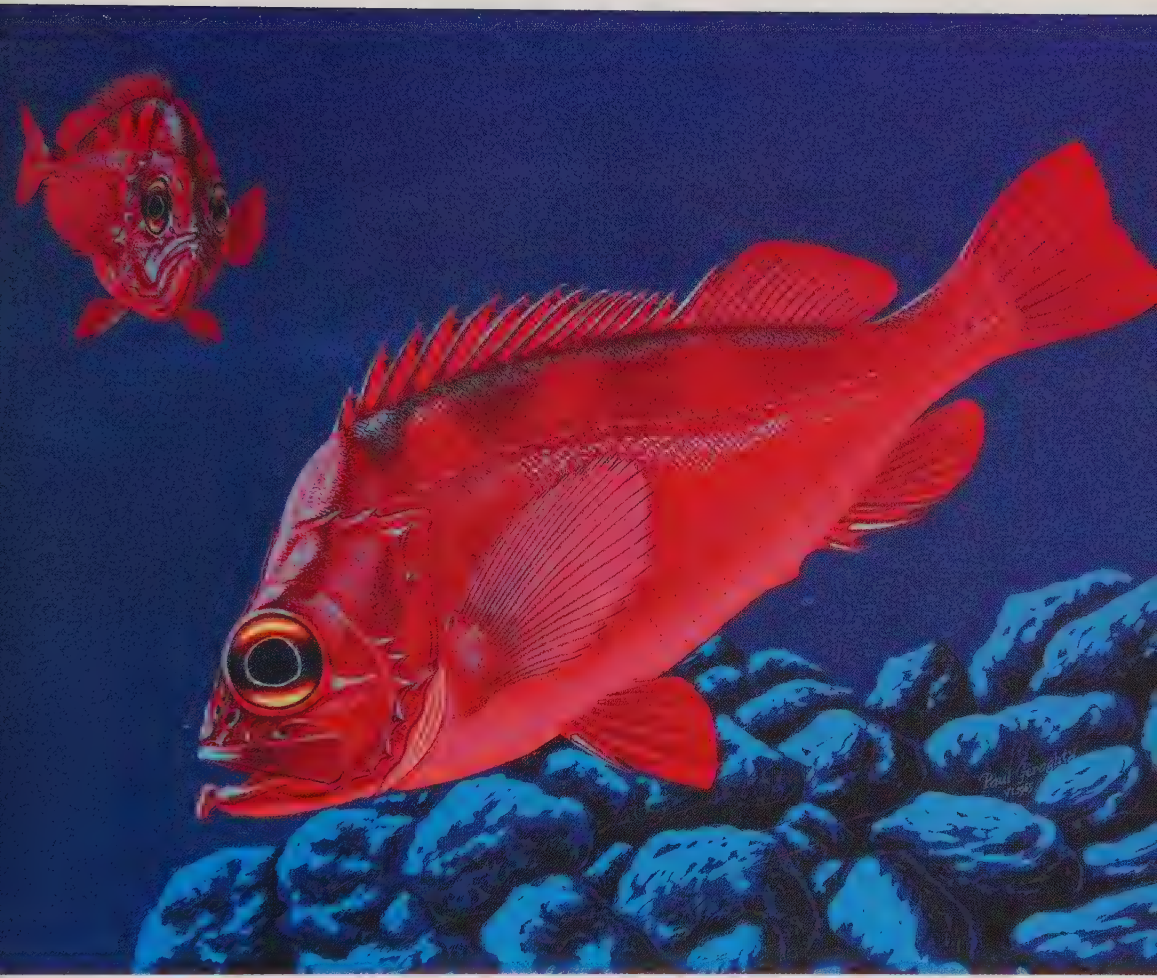
4 Lower jaw projecting to or beyond upper jaw; barbel minute or obsolete .. 5
Lower jaw not projecting to or beyond upper jaw (i.e. snout projecting); barbel well developed, sometimes small 7

5 Base of first anal fin long, its origin below the origin of first dorsal fin .... genus *Micromesisteus* (p. 209)
Base of first anal fin moderate in length, its origin below origin of 2nd dorsal fin 6

6 Scales imbricate (overlapping); pectoral fins extending to insertion of first dorsal only; pelvic fins reduced, less than ¾ length of pectoral fins .... genus *Pollachius* (p. 212)
Scales not imbricate; pectoral fins extending to origin of 2nd dorsal; pelvic fins well developed, more than ¾ length of pectoral fins .... genus *Boreogadus* (p. 189)

7 Large black blotch on side above pectoral fin; lateral line black; first dorsal fin distinctly pointed .... genus *Melanogrammus* (p. 202)
No large black blotch on side; lateral line light; first dorsal fin rounded 8

8 Barbel well developed but slender, its length about twice diameter of pupil of eye; eye large, its diameter 4.0–5.5 in head length .... genus *Gadus* (p. 194)
Barbel short, stout, its length only slightly greater than diameter of pupil; eye


Paul Geraghty

Redfish, *Sebastes marinus*

(Drawn by Paul Geraghty)

small, its diameter 6.2 or more in head length .... genus *Microgadus* (p. 208)

9 First ray in dorsal fin prolonged and thread-like 10

First ray in dorsal fin not prolonged 12

10 Remaining rays in dorsal fin graduated in size and readily visible; no barbels on snout .... genus *Urophycis* (p. 214)

Remaining rays in dorsal fin reduced in size, uniformly short, hair-like and inconspicuous; 2 or 3 barbels on snout 11

11 Three barbels on snout, 2 lateral and one median; black blotch on posterior portion of both dorsal and anal fins .... genus *Enchelyopus* (p. 193)

Two barbels on snout, no median barbel; no black blotch on dorsal or anal fins .... genus *Gaidropsarus* (p. 200)

12 Pelvic fins consist of 2 filamentous rays only, the longest extending to pectoral tip or beyond .... genus *Urophycis* (p. 214)

Pelvic fins with 6 or 7 rays, one or 2 may be slightly prolonged 13

13 Anal rays 37–42; barbel absent; tip of pectoral fin extending beyond insertion of first dorsal .... genus *Merluccius* (p. 205)

Anal rays 55–81; barbel well developed; tip of pectoral fin extending to middle of first dorsal fin or only slightly beyond .... genus *Molva* (p. 210)

14 Upper jaw projecting beyond lower; snout with a strong lateral shelf-like projection on each side; a small barbel present .... genus *Antimora* (p. 187)

Lower jaw projecting; no lateral projections on snout; barbel absent .... genus *Halargyreus**

Family MORIDAE Moras

The members of this family are considered to be closely related to the cods of the family Gadidae but differ sufficiently from them in osteological, morphological, and biological features to warrant recognition as a distinct group.

The moras are generally deep-sea forms, thus inhabiting deeper waters than the cods, and in common with many groups of deep-sea fishes, are rather generally distributed throughout the deep oceans of the world.

The family contains about 70 species, one of which occurs, not infrequently, in the deeper waters off the Canadian coast.

Blue antimora Antimore bleu

Antimora rostrata Günther 1878

OTHER COMMON NAMES: blue hake

DESCRIPTION: Body elongate, compressed, tapering to a slender tail, greatest depth 5½ in total length. Head 5 in total length, depressed; upper jaw longest, forming a broad roof-like projection over the mouth, with conspicuous keels running from snout to posterior margin of eye; bands of sharp teeth on jaws and on vomer; angle of mouth under posterior border of eye; barbel on lower jaw. Eye, 5 in head; interorbital space flat. Fins: dorsals (2), first 4, first ray prolonged to about 5 times length of 2nd ray or equal to length of head, second 53, long, slightly indented in its last third, these fins reach from the level of the base of the pectoral to the caudal peduncle; caudal slender, rounded; anal, 40, deeply indented at ⅗ of its length, almost giving the appearance of 2 fins, it extends from under the middle of the 2nd dorsal to the caudal peduncle; pectorals moderately large, pointed, located low on sides behind gill opening, ending below 6th ray of 2nd dorsal; pelvics, 6, longest ray filamentous, reaching over half way to tip of pectorals, located below and in front of pectorals. Lateral line faint. Scales small, in 115 rows. Distance from snout to vent exceeds that from vent to tip of tail.

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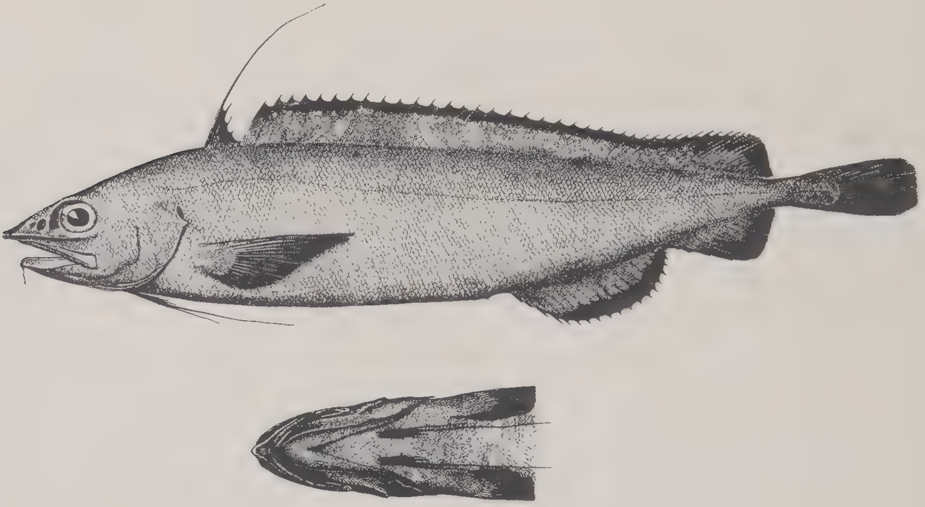
* Detailed account not given.



Colour, deep-violet or blue-black including belly. The blue antimora in North American Atlantic waters was originally described by Goode and Bean[169] as *Haloporphyrus viola*, using specimens taken on the LaHave Bank in 400–500 fathoms. In their text, Oceanic Ichthyology,[170] the same authors referred the species to the genus *Antimora*, listing it as *A. viola*. The specific name *viola* was used in reference to its deep-violet colouration.

DISTINCTIONS: The blue antimora is distinguished from the common, spotted and longfin hake by the deep indentation of its anal fin, by its flattened, keeled snout, by its 6-rayed pelvic fins and by the posterior position of the vent.

SIZE: Up to 21½ inches in length.

RANGE: Widely distributed in deep water in the North Atlantic. It has been reported on the east from Denmark Strait to Gibraltar and on the west from southern Baffin Island to Cape Hatteras; in the south Atlantic off Uruguay ("Challenger Reports"). In the eastern Pacific it has been reported from British Columbia waters southward to Panama. It also occurs in the southern Indian Ocean. In deep water, ranging from 230 to 1456 fathoms.

Canadian distribution: In deeper waters from southern Baffin Island, Ungava Bay, and Labrador southward along the continental slope. Canadian depth records range from 230 to 700 fathoms. The blue antimora has long been known to occur in Canadian Atlantic waters, for Goode and Bean[169] described this species from specimens taken on LaHave Bank as noted above. Goode and Bean[170] also reported it from the southern edge of the Grand Bank (lat 42°55′N and long 50°51′W) in 471 fathoms. Northwest of this latter record 22 specimens were taken on July 17, 1953, in 230–260 fathoms at lat 44°03′N and long 52°37′W. It was taken in the Davis Strait area by the Danish Ingolf Expedition, 1898. Its occurrence in this region has been more recently confirmed by captures in Davis Strait, off Cape Mercy, and southward in Ungava Bay and northern Labrador (Templeman and Squires, 1960, personal communication). Schroeder's[114] report for Nova Scotia banks and southward indicate moderate numbers (averaging 14–29 specimens per haul) were taken in 300–700 fathoms.

BIOLOGY AND ECONOMICS: Bigelow and Schroeder[49] suggest that blue antimora may be one of the more plentiful fishes in waters over 350 fathoms off the middle Atlantic states. There is no evidence to suggest, however, that the species occurs in sufficient numbers in Canadian waters to have any commercial value.

Family GADIDAE — Cods

The Gadidae are marine fishes of cool waters occurring principally in northern seas but a few species have become established in the southern hemisphere. They reach their greatest abundance in the shallow waters of the continental shelf but some species have penetrated to the abyssal depths. These are soft-rayed fishes, the first dorsal and pelvic fins sometimes filamentous, caudal distinct or sometimes joined to dorsal and anal, scales small and cycloid, mouth usually large and gill openings wide; a single chin barbel is often present and sometimes barbels are present on the snout.

The cods are principally predaceous fishes feeding heavily on other fishes and invertebrates. Many species are of great commercial value being captured principally by otter trawls and baited hooks.

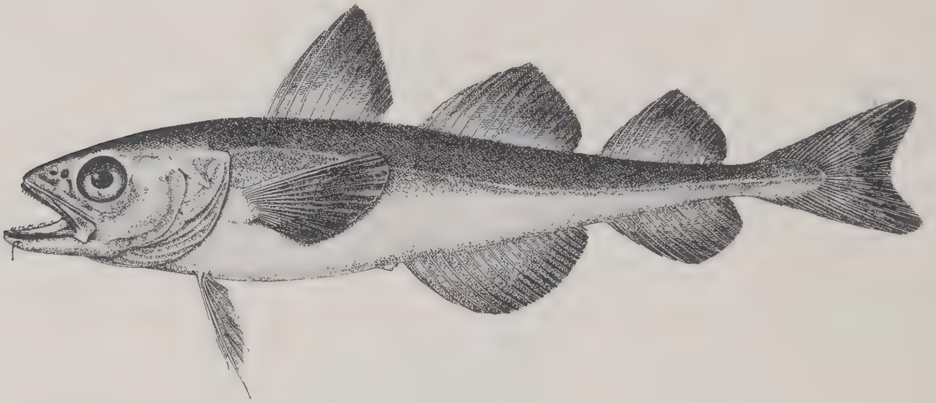
The family contains a total of about 59 species, 19 of which have been reported to occur in the Canadian region. Generally speaking the cod family is the most numerous and best represented of almost any other family of fishes occurring in our area.

Arctic cod — Saida

Boreogadus saida (Lepechin) 1774

OTHER COMMON NAMES: polar cod, polardorsch, morue polaire, morue arctique

DESCRIPTION: Body slender, little compressed, depth 6 in total length, greatest at origin of 1st dorsal; caudal peduncle slender. Head 4½ in length, snout bluntly rounded, lower jaw projecting; barbel on lower jaw very small; teeth in both jaws slender, sharp and widely set; angle of mouth extends to under middle of eye. Eye 4½ in head. Fins: dorsals (3), all relatively low, 1st 11–13, triangular, higher than 2nd and 3rd, 2nd 13–16, 3rd 18–23;[513] caudal distinctly forked; anals (2), 1st 15–18, 2nd 19–22, located under 2nd and 3rd dorsals; pectorals large, inserted on sides behind operculum, reaching as far back as posterior edge of 1st dorsal; pelvics small, inserted ventrally well in advance of pectorals, 2nd ray extending beyond others for almost half its length. Lateral line sinuous and variable. Scales small.



Colour uniform brownish above, silvery below; many fine black points scattered over the back; all fins dusky with narrow, pale edging.

Distinctions: The arctic cod may be distinguished from related species by its forked tail and slender body. Only it and the pollock combine 3 dorsal fins and a very small barbel; the pollock has a small pelvic and a much deeper body.

Size: Up to 15 inches in length, but rarely over 9 inches.[221]

Range: Circumpolar in salt waters, (entering fresh water[519]) of east and west Greenland, Iceland, Jan Mayen, Spitzbergen, Barents Sea, White Sea, Murman Sea, Kara Sea, Ice Sea of Siberia, Bering Sea, seas of the Northwest Territories of Canada, Baffin Bay, Hudson Bay, Labrador coast south to northwestern Gulf of St. Lawrence. This fish has been observed farther north than any other—at lat 84°42′N.[221]

Canadian distribution: Reported as frequent at many points in the Northwest Territories, such as Herschel Island, Prince Patrick Island, Victoria Island, Dolphin, and Union Strait, Amundsen Gulf and Coronation Gulf.[517] From many trawling stations in southern, central, and eastern Hudson Bay; from Nottingham Island and Wakeham Bay in Hudson Strait.[496] From Port Burwell, Ungava Bay.[124, 496] From the Labrador coast at Hebron, Nain, and Chateau Bay.[23, 25, 122, 172, 240] From Riviere Ouelle and Kamouraska, Quebec (in the St. Lawrence estuary).[502] From Miramichi Bay, Gulf of St. Lawrence, in winter.[309]

Biology and Economics: The arctic cod is a distinctly arctic species that occasionally strays into the Gulf of St. Lawrence. It is reported from very cold water (29.5 and 28.7 F).[25, 221] It is found close to shore among ice floes and also in depths up to 400 fathoms. It is found pelagically near drifting ice and may be carried offshore by such ice movement. There is some indication that it spawns in late winter or early spring.[309] One 8-inch female contained 12,700 eggs. In East Greenland its food consists of amphipods and mysids. It is eaten by seals, foxes, and birds.[221]

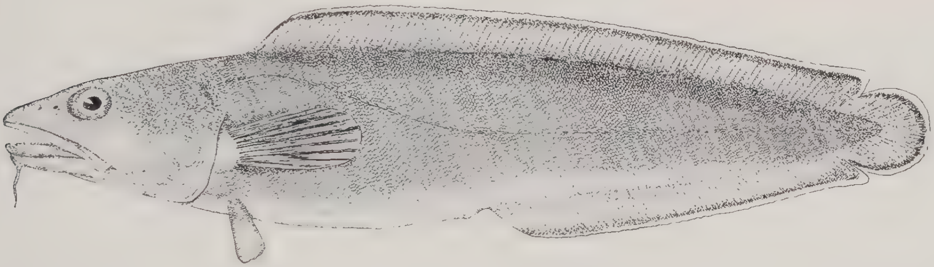
At the present time it is not sufficiently abundant in Canadian waters to have commercial value.

Cusk **Brosme**

Brosme brosme (Müller) 1776

OTHER COMMON NAMES: brosmius, tusk, torsk

DESCRIPTION: Body somewhat elongate, greatest depth 5½ in total length, about midway between gill opening and vent; cylindrical before vent, compressed behind. Head 4¾ in total length, bluntly pointed, flattened above, upper jaw slightly longer; barbel on lower jaw, longer than eye diameter; several rows of sharp teeth on jaws, vomer and palatines; angle of mouth under posterior part of eye. Eye 5 in head, a little more than its own diameter behind snout.



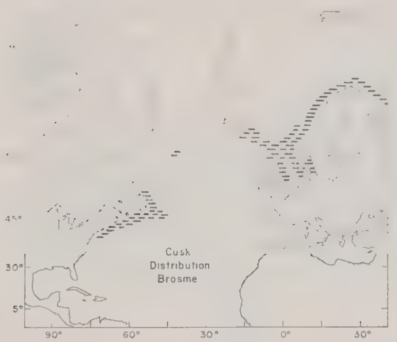
Fins: dorsal (1), 85–105, uniform in height, extends from above middle of pectoral and is confluent with caudal, but deeply notched at junction; caudal evenly rounded; anal (1), 71–76, similar to dorsal but shorter, beginning behind vent, i.e. at middle of body and confluent with caudal, also deeply notched at junction; all unpaired fins are fleshy at base tapering to thin margins; pectorals moderate, rounded, on mid-side behind gill opening, half length of head; pelvics smaller, inserted directly under base of pectorals whose length they equal. Lateral line indistinct. Scales small, covering head and trunk.

Colour, variable depending somewhat on size and environment. Upper parts dark-reddish or greenish-brown to pale-yellowish, shading into cream colour on belly. Young fish have about 6 vertical, yellowish bands on sides; these are lost by larger fish. Sometimes small inky-black spots on sides. Unpaired fins of general body colour at bases with black near margins, edged with white. Pectoral and pelvic fins same colour as sides, the latter blackish near tips.

DISTINCTIONS: The cusk most closely resembles the hakes and rocklings but is distinguished from both by having a single dorsal fin, and from the rocklings by the single barbel on the chin. The joining of the dorsal, caudal, and anal fins also assists in distinguishing it from the hakes and rocklings.

SIZE: Up to a length of 40 inches and a weight of 27 pounds. Usually not over 36 inches long.

RANGE: The cusk inhabits the moderately deep waters on both sides of the North Atlantic. On the North American side, it ranges along the coast from the Strait of Belle Isle and on the Banks off Newfoundland and Nova Scotia, southward to Cape Cod and occasionally to New Jersey. It is rare at Greenland. On the European coast it frequents the north coasts of the British Isles, Denmark (Jutland), the northern part of the North Sea and Kattegat off Bohuslan, Sweden, to Iceland and the Murman Coast.



Canadian distribution: Occurrence northeast of the Laurentian Channel is very rare. The only report of cusk from the Grand Bank was that of Goode.[166] The statement may be questioned, as none appear to have been caught there since. There is a definite record from 80 fathoms in the Strait of Belle Isle, this specimen being preserved in a museum.[523] The species was recorded once for Cheticamp, Nova Scotia, from fishermen's statements, by Cox.[95] McKenzie[312] notes that the cusk is rare on the Miramichi coast and occurs but rarely in the mouth of Chaleur Bay. Cusk are caught on the following banks off the coast of Nova Scotia: Banquereau, Canso, Middle Ground, Sable Island, Emerald, LaHave, and Browns. They are common near Seal Island, Nova Scotia, and in the lower Bay of Fundy, near Grand Manan and St. Mary Bay; rare farther into the Bay of Fundy.[205]

BIOLOGY AND ECONOMICS: Cusks are essentially northern, deep-water fishes, that live on rocky and other hard bottom but rarely on mud. They tend to be sluggish and to remain on the bottom, in 10–500 fathoms, within temperature limits of about 33–50 F. Investigations on the Sable Island Banks suggest the species is most abundant at depths of about 60 fathoms and in a temperature range of 41–46 F.

They spawn in spring and early summer, large females producing about 2 million eggs. The eggs are buoyant and spherical, 1.3–1.5 mm in diameter and have an oil globule. After hatching the larvae remain pelagic until they are about 2 inches long, when they seek bottom. Their subsequent rate of growth appears to be unknown.

Cusk feed on molluscs and crabs and occasionally eat starfish.

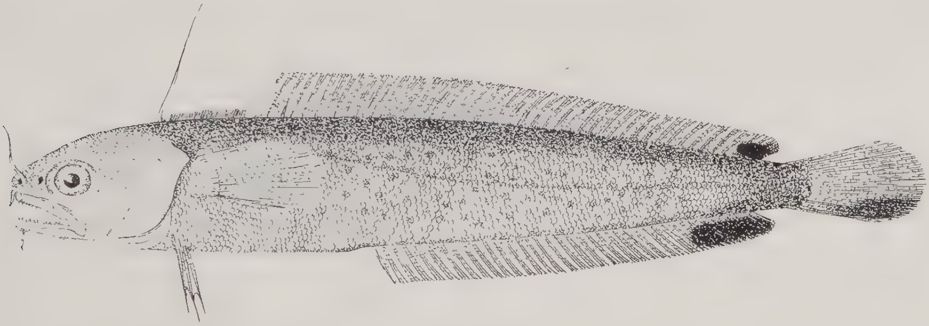
They have some commercial importance as a food fish, being marketed fresh, frozen, and salted. They are caught on handlines, longlines, and by otter trawl, and occasionally one is caught in a lobster trap. The majority, however, are caught on longlines, presumably because they occur more commonly over rough bottom.

The catch of cusk from the Canadian Atlantic area for 1962 was 5,835,000 pounds, with a value of $179,000.[70b]

Fourbeard rockling **Motelle à quatre barbillons**

Enchelyopus cimbrius (Linnaeus) 1766

DESCRIPTION: Body slender, tapering from the tip of the pectoral fins to caudal peduncle, depth 7–8 in total length. Head 5½ in total length, snout blunt and rounded, upper jaw slightly longer than lower, 3 barbels on snout, one in front of each nostril and one in midline; a 4th barbel on lower jaw; small, uneven teeth in upper jaw, 6–8 enlarged ones in front; similar, but more even teeth in lower jaw; angle of mouth under middle of eye. Eye large, 4 in head, horizontal diameter greater than vertical one. Fins: dorsals (2), first greatly reduced, a single ray, above gill opening, over ½ as long as head, followed by about 50 very short, separate, hair-like rays without any connecting membrane, capable of being laid down in a groove; second dorsal well developed, 45–53, fairly uniform in height, extending from middle of pectoral fin to caudal peduncle; caudal rounded; anal, 39–43, shorter than 2nd dorsal, beginning a short distance behind tip of pectorals and extending to caudal peduncle; pectorals large, situated on mid-side behind gill opening, a little shorter than head; pelvics, 5–6, slender, pointed, situated below and in front of pectorals. About 35 pores distributed along lateral line. Scales small.



Colour, dark yellowish-olive or dusky-brown on back, paler on sides, with whitish belly dotted with brown; side of head silvery; 1st dorsal ray, posterior edges of 2nd dorsal and anal fins, lower half of caudal fin and pectoral fins dull bluish-black; pelvic fins pale; cavity of mouth dark-bluish.

DISTINCTIONS: The fourbeard rockling closely resembles the hakes but is easily distinguished by the three barbels on the upper jaw and the much reduced first dorsal fin. Its four barbels distinguish it from the arctic threebeard rockling, which has only two barbels on the upper jaw plus one on the lower jaw.

SIZE: Up to a length of 12 inches but Frost[152] has given an average length of 6–10 inches for Newfoundland waters.

RANGE: On both sides of the North Atlantic. On the western side from the northwestern Gulf of St. Lawrence to off Cape Fear, North Carolina. At Iceland, Finmark, and on the coast of northwestern Europe south to the English Channel. *Canadian distribution:* As adults: from Trois Pistoles, Quebec, in the St. Lawrence estuary;[357, 514] caught in deep water off the mouth of the Saguenay River and at Fame Point, Quebec, in 100–104 fathoms, June and July 1953 (*J. J. Cowie* records); off Douglastown, New Brunswick; Cheticamp, Nova Scotia;[95] Chedabucto Bay, N.S.[91] Generally distributed, but not abundant, in the Bay of Fundy, including Passamaquoddy and St. Mary bays.[205] As larvae: reported from Raleigh, Newfoundland;[209] in Cabot Strait and much of the northeastern part of the Gult of St. Lawrence;[206] Port au Port Bay, Nfld.;[228] off Notre Dame Bay, Nfld., Grand Bank generally, St. Pierre Bank, Cabot Strait and west coast of Newfoundland;[17, 18, 19] Gulf of St. Lawrence and outer coast of Nova Scotia.[102] Some doubt is expressed whether, in some instances, these may have been the larvae of the arctic threebeard rockling, especially in areas where adult fourbeard rockling have not been taken.[49, 102]

Biology and Economics: The fourbeard rockling is a bottom fish which, despite its name, is usually taken over soft mud, sand or gravel bottom. It is a deep-water form occurring in greater numbers at depths of 30 fathoms or more in gullies and off the continental slope. At times, however, it may occur in relatively shallow water, such as in St. Mary Bay, Nova Scotia, as noted by Huntsman.[205] Egg collections, as reported by Battle[28, 29] indicate that spawning occurs in Passamaquoddy Bay region from late May or early June until late August, September, or even October, depending upon water temperatures. There is some periodicity in spawning, more eggs being released at the times of highest tides. Battle's[28, 29] studies demonstrated that the eggs are buoyant, transparent and spherical, varying in diameter from 0.65 to 0.75 mm and having an oil globule with a diameter of 0.13–0.15 mm. Further, that normal development occurs between temperatures of 55 and 66 F (13–19 C) and at salinities of 18.6–45 ‰. The fry remain pelagic during the period of early growth but nothing is known of the subsequent growth rate.

Adults are believed to eat various small crustaceans such as shrimps and sometimes small fishes. However, because of its small size it is not usually caught in commercial gear and much of its biology is unknown.

Except for the work on embryology and development by Battle noted above, few studies of the rockling have been conducted in North American waters and consequently statements concerning its biology stem largely from European studies. Although regarded as the same species, the form occurring in European waters is usually named *Onus cimbrius* Linnaeus or *Motella cimbria* Day by British authors.

Outside of the fact that it forms part of the food supply of such species as cod, the fourbeard rockling is unimportant economically.

KEY to Species of GADUS

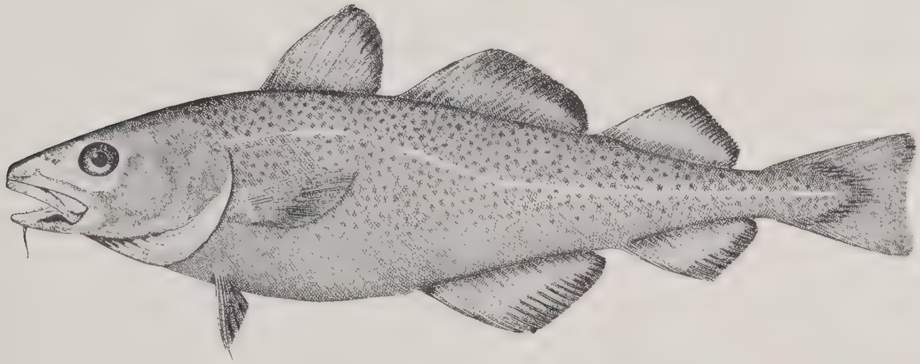
Body generally spotted; peritoneum leaden-silvery in colour .... Atlantic cod, *Gadus morhua* (p. 194)
Body unspotted; peritoneum uniformly jet black in colour .... Greenland cod, *Gadus ogac* (p. 199)

Atlantic cod — Morue franche

Gadus morhua Linnaeus 1758

Other common names: cod, codfish, morue commune, cabillaud

Description: Body elongate, stout, slightly compressed, tapering from vent; depth at 1st dorsal fin $\frac{1}{5}$–$\frac{1}{4}$ of length. Head, large, $3\frac{1}{4}$–$4\frac{1}{2}$; nose conical and blunt; mouth terminal, wide, angle of jaw extending back to anterior margin of eye; lower jaw slightly shorter, with barbel; many small teeth in each jaw and on vomer. Eyes moderate, about 5½ in head. Fins: dorsals (3), 1st 13–16, shortest and highest, its height about ½ length of head, its origin slightly behind gill opening, 2nd 19–24, and 3rd 18–21, dorsals lower and longer, separated by short intervals, a slightly longer space between the posterior edge of 3rd fin and the caudal; caudal slightly concave posteriorly; anals (2), 20–24 and 17–22, under 2nd and 3rd dorsals and about equal to them in size, origin of 1st anal just behind vent; pectorals on sides just behind gill opening, length about equal to height of 1st dorsal; pelvics low on body, slightly in front of pectorals, smaller than pectorals, 2nd ray slightly extended and filamentous. Lateral line distinct, arched in forward two-fifths. Scales small; peritoneum leaden-silvery with black dots.

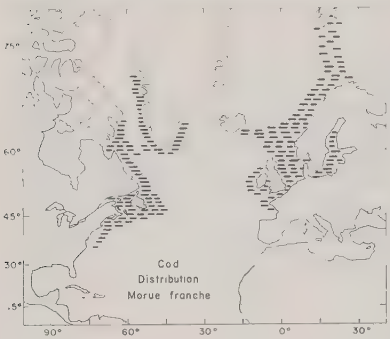


Colour, various shades of grey to green or brown to red, depending on background; capable of changing to match surroundings; back and sides with numerous rounded brownish to reddish spots; lateral line pale; fins of same tint as body; belly whitish.

Distinctions: The cod is distinguished from the tomcod by the 2nd ray of the pelvic fin being prolonged into a short filament not over ¼ the length of the fin, while in the tomcod the prolongation equals the length of the remainder of the fin. The cod is distinguished from the haddock by the lateral line which, on the cod, is pale and on the haddock, black. The cod differs from the pollock in shape, colour, caudal fin shape, and projection of jaw; the pollock has a sharp, very sleek outline, a forked caudal fin, a projecting lower jaw, is bluish or greenish in colour and lacks spotting. The polar cod (*Boreogadus*) has a forked caudal fin, that of the cod only slightly concave, and the polar cod has a projecting lower jaw, the cod a projecting upper jaw. The cod differs from its close relative, the Greenland cod (*G. ogac*), since it (the cod) has a smaller eye (½ length of snout), a stouter caudal peduncle, and a leaden-silvery peritoneum (black in *ogac*).

Size: Average weight is about 5 pounds and, although weight does not usually exceed 60 pounds, there is one record over 200 pounds.

Range: The cod inhabits the waters on both sides of the North Atlantic Ocean. The principal fishing grounds are found off Greenland, Newfoundland, and the Canadian mainland. On the North American side of the Atlantic the range of this species, which occurs from inshore waters to the edge of the continental shelf, extends from Port Burwell in Hudson Strait, West Greenland, Davis Strait, south to its extreme southern limit off Cape Hatteras, N.C., lat 35°10′N.[533] On the European coast Atlantic cod are caught off Iceland, Bear Island, and from Novaya Zemlya and Spitzbergen, south to the Bay of Biscay; also in the Baltic as far as Finland. A related species, *G. macrocephalus*, occurs in the North Pacific Ocean.



Canadian distribution: From Cape Dyer, Baffin Island southward with increased numbers in Ungava Bay;[463] more abundant on the Labrador coast, and extensive fisheries exist from there southwards to the United States border. Cod are caught abundantly inshore and on all the banks, particularly Hamilton Inlet Bank, Grand Bank, Banquereau, and Sable Island Bank. There are important cod fisheries in the Gulf of St. Lawrence, especially on the Gaspé coast. Cod occur in the St. Lawrence estuary as far up as Kamouraska and Charlevoix counties, Quebec. They are present but not abundant in the upper half of the Bay of Fundy.

BIOLOGY AND ECONOMICS: Cod in different areas show differences in rate of growth and in such characters as vertebral count, and number of circuli laid down on the scales in the first year. This suggests that there is little mixing of the stocks over wide areas. However, they are subject to movement in all stages, as eggs, fry, and adults. At first the eggs and fry are carried by the water movements; later they migrate for other reasons. Large numbers of adult cod have been tagged. On the average over 20% of these have been recaptured and much has been learned of their movements.

Labrador cod show coastwise migrations both north and south but they do not move into the Gulf of St. Lawrence nor to the southern Grand Bank. They remain in cold waters.

Most of the cod of commercial sizes found in the southwestern Gulf of St. Lawrence in summer migrate into deep water and southeastward out of the Gulf in late fall and return to the Gulf in the spring.[298] A similar migration out of the Gulf in late fall and winter and into the Gulf in spring occurs to the west of Newfoundland.[477] Recent taggings have shown that cod from the Quebec north shore (as far west as Seven Islands) join the west Newfoundland cod and migrate out of the Gulf in winter and into the Gulf in spring. These Gulf fish do not move beyond the Strait of Belle Isle and only very exceptionally do they go beyond Fortune and Placentia bays, Newfoundland.

The migrations of the mature cod on the Nova Scotia and St. Pierre banks are less extensive than in the Gulf. There is generally an inshore movement in summer and an offshore movement in winter. Many cod were recaptured near the point of tagging, even after several years.

Cod, tagged inshore west of Halifax, remained close to the tagging area for the most part but some straying took place in all directions, but chiefly to the eastward. Extreme cases show movement from Cape Sable, N.S., to the Strait of Belle Isle. There is a tendency to move inshore in spring and summer and offshore in winter.

Further south there is a well-established winter migration from Nantucket Shoals to Rhode Island and North Carolina, with a return the following spring.[410]

Cod spawn over a wide area of the continental shelf but the area involved is so large and varied that generalizations concerning spawning grounds can be misleading. However, to the north off Newfoundland and Labrador spawning usually occurs in deeper water, to over 100 fathoms, while southward spawning takes place in shallower waters of 60 fathoms or less. Some cod spawn off western Nova Scotia and in the Bay of Fundy but these areas are less important. On the Grand Bank spawning begins in April and continues to June probably reaching its peak in the latter half of May. On the south shore of Newfoundland spawning begins in May. On the banks off Nova Scotia cod spawn in April and occasionally as early as March. There is a small autumn spawning population in the Halifax Harbour—St. Margaret's Bay area; the cod belonging to it spawn from late September to December.[305] Farther south cod spawn extensively on Georges Bank and in Ipswich and Massachusetts bays but not to any extent along the coast of Maine.[49]

Cod are prolific. Female cod, 40 inches long, produce approximately 5,000,000 eggs, while a 52½-inch one produced over 8,000,000.[356] The eggs are buoyant, spherical, 1.2–1.8 mm in diameter. They float in water of $30\ {}^{\circ}/_{\circ\circ}$ salinity (coastal surface water), consequently they rise and remain at or near the surface during incubation.

Atlantic cod grow at different rates in different areas and there is annual variation in the same area. Consequently, actual lengths as given below are subject to some change. In general, growth is slower off Labrador and eastern Newfoundland than on southern Grand Bank and is slower in the Gulf of St. Lawrence than on the Scotian Banks. Although cod up to 16 years old are not uncommon, much younger fish make up the bulk of the commercial catches.

The following table gives the average lengths of cod, as ascertained over a period of years, at various ages from three areas. For further information, see Fleming[138b] and Martin.[281]

Atlantic cod are voracious feeders. As fry they eat copepods, barnacle larvae, amphipods, and other small crustaceans. As young adults their chief food continues to be crustaceans such as shrimp, small lobsters, spider crabs, hermit crabs, euphausiids, and mysids. After cod reach a length of about 20 inches fish become the predominant food, with herring ranking high; where available, capelin are eaten in quantity; on the offshore banks, sand lance are important in the diet; other fishes eaten include mackerel, redfish, hake, flounders, blennies, cunner, sculpins, silversides, shad, alewives, young cod, and young haddock. Molluscs form a less important part of the diet of Canadian cod; forms eaten include squid, sea clams, whelks, mussels, and nudibranchs; Georges Bank cod eat more molluscs than do Canadian cod. The cod also eats a wide variety of other animals, such as tunicates, comb-jellies, brittle stars, sea cucumbers, marine worms, fish cuttings or dressings from fishing boats, and even an occasional sea bird.

A nematode, *Porrocaecum decipiens*, occurs in the muscle of cod, particularly in those caught inshore.

Average length in centimetres (and inches) at each age.

Age	SW Gulf of St. Lawrence		Southern Grand Bank		Labrador (inshore)	
	cm	*inches*	*cm*	*inches*	*cm*	*inches*
2	22	8.7	–	–	–	–
3	30	11.8	44	17.3	–	–
4	38	15.0	49	19.3	41	16.1
5	47	18.5	52	20.5	44	17.3
6	52	20.5	60	23.6	49	19.3
7	60	23.6	70	27.6	52	20.5
8	64	25.2	77	30.3	54	21.3
9	70	27.6	84	33.0	56	22.0
10	72	28.3	88	34.6	58	22.8
11	79	31.1	90	35.4	58	22.8
12	–	–	91	35.8	59	23.2
13	–	–	92	36.2	59	23.2
14	–	–	96	37.8	62	24.4
15	–	–	–	–	64	25.2

The Atlantic cod is a cold-water species and mature specimens do not occur in quantity in water with a temperature above 50 F, although the fish is able to live in temperatures up to 66 F.[303] Within the range of 31–50 F cod have preferences that are influenced by time of year, size of fish, and geographical location. No simple answer can be given to the question of what temperature is preferred.

Cod has been a most important species commercially ever since the early settlement of Canada and it continues to hold this position. The quantity of cod caught and landed in 1962 from the western North Atlantic, where fishermen of sixteen countries are engaged in the fishery, is reported as 2.6 billion pounds. Of this total, Canadian landings were 586 million pounds, with a value of $18,600,000.

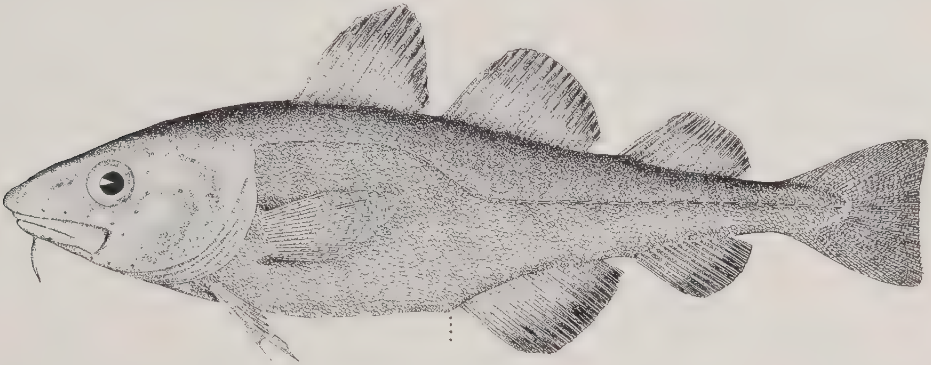
The Atlantic cod is caught by otter trawls, line trawls, handlines, jiggers, pair trawls, Danish seines, traps, and gill nets. They are used fresh, frozen, smoked, salted, and canned. By-products include fish meal, cod liver oil, and glue. The salt fish industry, of long standing for export, is now second in importance to fresh and frozen fillets and frozen blocks and sticks.

Greenland cod **Ogac**

Gadus ogac Richardson 1836

OTHER COMMON NAMES: ogac, uvak, pilot, morue de roche, poufin

DESCRIPTION: Very similar in form to the common cod (*Gadus morhua*). Head $3\frac{2}{3}$ in total length, upper jaw projecting beyond lower; a stout barbel, $\frac{1}{5}$ length of head, on lower jaw; angle of mouth under middle of eye. Eye 5 in head. Fins: dorsals (3), 1st 13–17, not quite as high as long, 2nd, 16–20, $\frac{2}{3}$ as high as long, 3rd 16–20; caudal truncate; anals (2), 1st 19–23, 2nd 16–19, located under 2nd and 3rd dorsals; pectorals moderate; pelvics inserted below and considerably in front of pectorals. Lateral line distinct. Scales small. Peritoneum uniformly brown-black to black.



Colour, dark, blackish-brown above with yellowish or bronze marbling on sides, white to gray below, tips of unpaired fins black, pectorals and pelvics dark-brown to black. Lateral line same colour as sides. Intensity of colour variable depending on background.

DISTINCTIONS: The Greenland cod has a slightly larger eye and a slightly more slender caudal peduncle than the common cod. The interorbital width of the Greenland cod averages 26.7% of the head length; the same space in the common cod averages 20.4% of the head length. The ovaries of the Greenland cod are jet to violet-black, those of the common cod lack this pigment. The lateral line of the Greenland cod is not accompanied by a light longitudinal stripe on the tail, as it is in the common cod. The Greenland cod lacks the characteristic round spots of the cod. (Note:—Some authors do not regard these differences as sufficient to establish separate species.[519] Others consider that the species are valid.[25, 221, 502] We are following the latter opinion.)

SIZE: Up to 28 inches in length.[221]

RANGE: West Greenland; west to Point Barrow, Alaska, and thence along the Canadian Arctic coast east and south to the Miramichi estuary, Gulf of St. Lawrence, and Cape Breton Island.[519] A closely related species occurs in the White Sea in Europe.

Canadian distribution: Along the shores of arctic Canada from Bathurst Inlet to Ungava Bay;[124]

from Hudson and James bays;[496] from the entire Labrador coast;[25, 240, 451] from the Strait of Belle Isle along the north shore of the Gulf of St. Lawrence to Seven Islands, Quebec;[502] Miramichi estuary, New Brunswick;[308] Bras d'Or Lakes, Nova Scotia.[419]

BIOLOGY AND ECONOMICS: The Greenland cod is found in inlets and close to shore and only rarely offshore in deeper water. It is tolerant of lowered salinity as is seen by its presence in James Bay and Lake Melville. There is no evidence that it enters fresh water.

In Greenland waters the maximum age of the Greenland cod is about 11 years. It matures at 3 and 4 years and spawns in February and March. Its food is very similar to that of the common cod; it eats capelin, small flounders, polar cod, shrimp, crabs, euphausiids, squid, annelids, molluscs, and echinoderms.[221] No comparable studies have been reported on Greenland cod in Canadian waters but it is probable that it behaves similarly.

The Greenland cod occurs sparingly on the Canadian coast and its commercial importance is small.

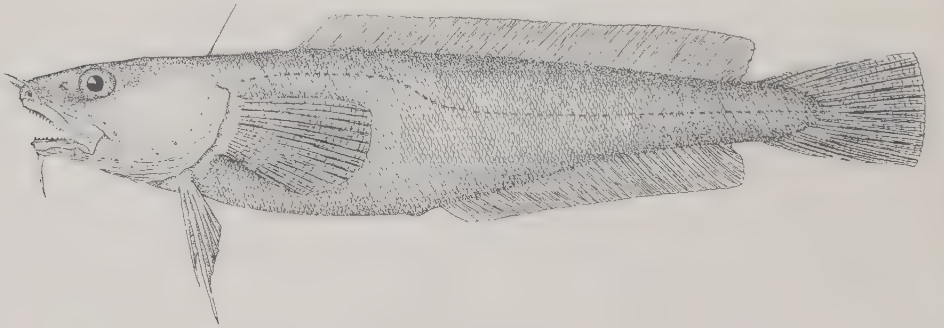
KEY to Species of GAIDROPSARUS*

Length of first ray in first dorsal fin 5.9–8.5% of total length of fish .... Silver rockling, *Gaidropsarus argentatus* (p. 200)
Length of first ray in first dorsal fin long, 14.0–20.3% of total length of fish .... Threebeard rockling, *Gaidropsarus ensis* (p. 201)

Silver rockling **Mustèle argentée**

*Gaidropsarus argentatus (*Reinhardt) 1838

DESCRIPTION: Body elongate, rounded, depth 5¾ in total length. Head 5 in total length, upper jaw longer, one barbel in front of each nostril and one on midline of lower jaw; teeth in several rows on jaws; teeth present on vomer; angle of jaw under posterior portion of eye. Eye 5½ in head. Fins: dorsals (2), 1st with one free ray scarcely longer than distance from tip of



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* Some authors employ the family Gaidropsaridae for the genus *Gaidropsarus*. In the present work *Gaidropsarus* is included as a genus within the Gadidae.

snout to eye, followed by a series of short fringe-like rays concealed in a groove, 2nd 54–59, low, extending to base of caudal; caudal moderate, rounded; anal (1) 45–46, extending from vent, i.e. middle of body to base of caudal; pectorals and pelvics as in *G. ensis*. Lateral line with about 27 enlarged pores along its entire length. Scales small.

Colour, reddish-gray, changing to bluish on head and belly, tips of unpaired fins and of barbels red. Jensen[221] noted that specimens from Greenland were red or even red-brown.

DISTINCTIONS: The silver rockling is distinguished from the fourbeard species by having only three barbels in all. It is separated from the threebeard rockling by the shortness of its first dorsal ray, which is less than half the length of the head. The lateral line in this species is more evident than it is in the threebeard rockling.

SIZE: Up to 16 inches in length.

RANGE: Coasts of southern Labrador, Greenland, Bear Island, Faroe Islands.

Canadian distribution:* Two specimens, 13 and 16 inches long, were caught on longlines off Hawke's Harbour, Labrador (lat 53°11′N, long 54°54′W) on August 19, 1956.

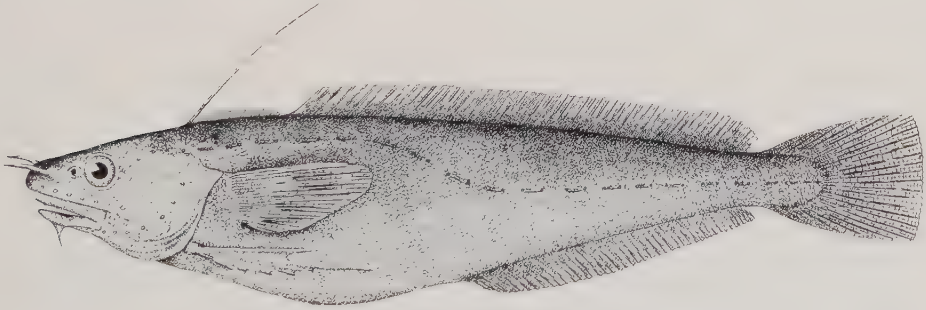
BIOLOGY AND ECONOMICS: A moderately deep-water form that occurs normally down to 400 metres and has been reported to occur in the North Atlantic to depths of 1428 metres.

Threebeard rockling **Mustèle arctique à trois barbillons**

Gaidropsarus ensis (Reinhardt) 1838

OTHER COMMON NAMES: arctic threebeard rockling

DESCRIPTION: Body rounded, moderately deep, depth 4½ in total length, deepest just before vent. Head 5¾ in total length, upper jaw longest, mouth moderate, its angle under posterior part of eye, a narrow band of teeth on each jaw, teeth on vomer; one barbel in front of each nostril, their length equaling diameter of eye, shorter barbel on lower jaw. Eye 5 in head. Fins:



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*A planktonic specimen just under 1 inch long was reported from farther northeast (lat 56°30′N, long 51°00′W) on September 12, 1950, by Hubbs,[200] who identified the specimen as *Gaidropsarus vulgaris* (Yarrell).

dorsals (2), 1st consists of one long ray, equal to length of head, followed by short fringe-like rays concealed in a groove, 2nd 59, low but fairly uniform in height, these fins extend from above gill opening to base of caudal fin; caudal moderately large, rounded; anal (1), 44–46, slightly lower than 2nd dorsal and shorter than it, extending from vent to caudal fin; pectorals large, bluntly pointed, inserted on mid-side behind gill opening, directed slightly upward, equaling length of head; pelvics 8, slender, one ray somewhat prolonged, inserted below and in front of pectorals and ending below tip of pectorals. Vent midway between tip of snout and tip of tail. Lateral line well marked. Scales small.

Jensen[221] reported that the colour of specimens caught in Baffin Bay by the "Godthaab" Expedition of 1928 was described as follows: ". . . head, back and sides light brick, on the belly faintly red with a blue-grey tint."

DISTINCTIONS: This rockling is distinguished from the fourbeard rockling by the presence of only two barbels on the upper jaw as compared with three on the fourbeard species. It differs from the silver rockling in having the first dorsal ray as long as the head or longer, while that of the silver rockling is much shorter.

SIZE: Size range of available specimens 310–400 mm.

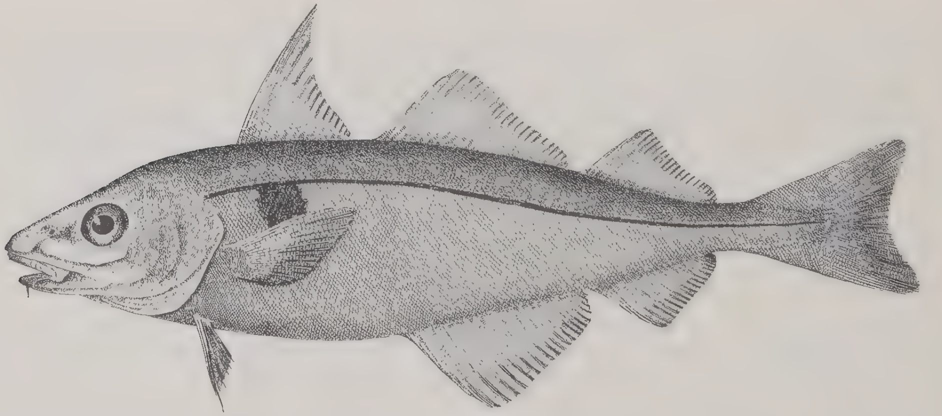
RANGE: Known from Baffin Bay, Greenland, and from deep water off the east coast of North America from near Browns Bank to off Cape Hatteras.

Canadian distribution: There are a few records of occurrence in Canadian waters. Goode and Bean[170] reported a specimen caught at lat 41°53′N, long 65°35′W in 858 fathoms, on edge of the continental shelf off Browns Bank. Zugmayer[539] reported a specimen taken off Halifax in 25 metres, but in this case the specimen should be re-examined. It was found to be not uncommon off northern Labrador and Baffin Island during experimental fishing in 1959.

Haddock **Aiglefin**

Melanogrammus aeglefinus (Linnaeus) 1758

DESCRIPTION: Body heavy, laterally compressed. Fins: dorsals (3), soft-rayed (14–17, 20–24, 19–22) 1st dorsal pointed and higher than 2nd; anals (2) soft-rayed (21–25, 20–24);



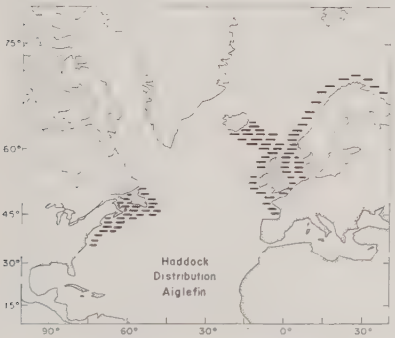
pelvics in front of pectorals; caudal lunate. Head: upper jaw projecting; lower jaw has short barbel; eye, 4 in head. Scales about 160 in lateral line. Lateral line black.

Colour, when fresh from water “. . . top of head, back and sides, down to lateral line are dark purplish-gray, paling below the lateral line to a beautiful silvery-gray with pinkish reflections. The belly and lower sides of the head are white. The dorsal, pectoral and caudal fins are dark-gray; the anal fins pale like the lower part of the sides and black-specked at the base; and the pelvics are white, more or less dotted with black.”[49] Marked black blotch on each shoulder between lateral line and middle section of pectoral fin.

DISTINCTIONS: The black lateral line and the black “devil’s mark” on the sides and the general colouration distinguish the haddock from its close relatives, the cod, tomcod, and pollock. The pointed first dorsal fin is diagnostic, since these fins in the cod, tomcod, and pollock are rounded.

SIZE: Commercial sizes range from about 15 to 25 inches and about 1–4 pounds, depending upon area of capture. The largest haddock on record was caught at Iceland. It was 44 inches long and weighed almost 37 pounds; very few haddock exceed a length of 30 inches and a weight of 10 pounds.

RANGE: Both sides of the North Atlantic. In North America from the Strait of Belle Isle to Cape Cod, with winter extensions in deep water to the latitude of Cape Hatteras; commercially important from the Grand Bank to Cape Cod. Occasionally it is caught off west Greenland and is abundant at Iceland and the Faroes. Found from the White Sea to the Bay of Biscay in Europe; abundant only from the southwest coast of Norway to southern England.



Canadian distribution: Haddock occur on the continental shelf from the Bay of Fundy to the southeastern Gulf of St. Lawrence, and eastward to the Grand Bank. They are not abundant in the western and northern portions of the Gulf of St. Lawrence or off the east coast of Newfoundland.

BIOLOGY AND ECONOMICS: Haddock live mainly on the bottom, and deep-water channels, such as the Fundian and Laurentian channels, act as barriers to their movements. Haddock off North America are divided into three main groups: (a) New England, (b) Nova Scotia, and (c) Newfoundland populations.[332] Within each of these main groups several discrete stocks occur. Thus haddock of the Grand Bank intermingle little with those of St. Pierre Bank.

Tagging of adult haddock has shown rather extensive seasonal migration off the Canadian mainland with less extensive migration in the New England region.[296, 332, 499] In addition haddock show marked seasonal differences in depth distribution particularly in the colder water of the eastern regions. In summer they spread into the shallow, warmer water of the banks. In winter they desert the open banks and move again into deeper water. Temperatures at which they are most abundant range between approximately 35–48 F.

Spawning haddock can be captured from late January to July depending on the area. Peak of spawning usually occurs on Georges Bank about March, on Nova Scotia Banks about April, on Grand Bank about June. There are definite spawning and prespawning concentrations on Georges, Browns, Emerald, and Grand Bank regions. Inshore spawnings seem to be relatively unimportant.

The eggs of the haddock are buoyant, spherical, about 1.2–1.7 mm in diameter. They have no oil globule and float in water of 28 $^{0}/_{00}$ salinity and are, therefore, found at or near surface of the sea. A 19¼-inch female produces 169,000 eggs, a 24-inch one 634,000 eggs, and a 28½-inch one 1,840,000 eggs.

Haddock eggs hatch in 25–32 days at 36 F; in 13–24 days at 41 F; and in 9–12 days at 50 F. They will develop normally over a temperature range of 36–54 F and are tolerant of a wider range of salinity than they are likely to encounter in nature; the eggs have been hatched experimentally in salinities ranging from 15 to 35 $^{0}/_{00}$.

While little is known of the actual movements of haddock eggs and larvae in Canadian waters, the fact that the eggs are pelagic for 2 weeks or more and that the larvae are believed to be pelagic for some 3 months, allows time for extensive drift from the spawning grounds before the young fish take to bottom.

Haddock fry in Europe reach a length of 1.2–1.5 inches in 3 months and begin to seek bottom. There is reason to believe that young North American haddock grow slightly faster.

At 5 years of age haddock average about 20 inches long, but there is a marked difference in growth by area. Thus at 5 years Georges Bank fish average 21 inches, Sable Island 18 inches, and Grand Bank 15–16 inches. Old haddock of, say, 10 years average 25 inches in length and rare individuals may grow larger.

The small subterminal mouth limits haddock to smaller articles of food, which consists predominantly of bottom forms including crustaceans, molluscs, echinoderms, annelids, and fishes. Over 200 species of invertebrates and fishes have been recognized from 15,000 haddock stomachs.[195] Brittle-stars and bivalve molluscs make up the bulk of their diet but a complete list would include representatives of all the major groups of invertebrates. Haddock that are caught on the banks show a preference for fish as food and this consists almost entirely of the sand lance (*Ammodytes*). Annelids constitute about 10% of the food of bank haddock. Studies indicate that haddock eat relatively less at spawning time.[196, 528]

During the fry stages, mackerel and jellyfish are known enemies and there are undoubtedly others. After the haddock take to the bottom they are eaten by cod, pollock, hake, monkfish, dogfish, and skate.

The haddock is an abundant and useful fish and is in great demand. It is marketed fresh, frozen, smoked, and to a small extent, canned. Formerly, quantities were salted and dried in Canada and Spanish catches continue to be salted. It is caught mainly by otter trawl but some are taken by a variety of other gear, including traps, baited hooks, and gill nets. The catch of haddock in the western North Atlantic in 1962 was 305 million pounds. Of this total the Canadian catch was 114,243,000 pounds, with a value of $4,846,000.[70b]

KEY to Species of MERLUCCIUS

Gill rakers on first gill arch 15–22; lateral line scales 103–130 .... Silver hake, *Merluccius bilinearis* (p. 205)

Gill rakers on first gill arch 9–11; lateral line scales 130–148 .... Offshore hake, *Merluccius albidus* (p. 205)

Offshore hake **Merlu blanc**

Merluccius albidus (Mitchill) 1818

The offshore hake is included because of its distribution northward along the Atlantic coast to the southeastern slope of Georges Bank (lat 40°46′N, long 66°48′W) as reported by Bigelow and Schroeder.[52] The same authors note that this species was not taken along the Nova Scotia shelf and slope in 1953 and suggest that the offshore hake did not range northward beyond Georges Bank at that time.

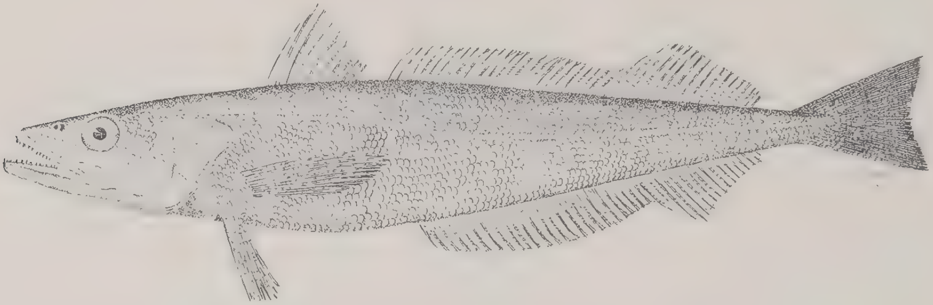
Since Canadians regularly fish over Georges Bank, there is reason to expect that this species will be taken although its general appearance is so similar to the silver hake, *Merluccius bilinearis*, that it may easily be mistaken for that species. It is most readily distinguished from the silver hake by the gill raker and scale counts (see Key).

Silver hake **Merlu argenté**

Merluccius bilinearis (Mitchill) 1814

OTHER COMMON NAMES: whiting

DESCRIPTION: Body moderately elongate, rounded to vent, slightly compressed posteriorly; maximum depth under first dorsal fin, 6½ in length, tapering gradually to a moderately small caudal peduncle. Head elongate and pointed, depressed, 4 in total length; mouth terminal, lower jaw projecting, extending back to middle of eye, jaws armed with 2 or more rows of sharp, recurved teeth; top of head with conspicuous W-shaped ridges. Eye 6 in head. Fins: dorsals (2), 1st, 11–14, originates a short distance behind gill opening, 3rd ray longest and equal to base length, 2nd, 37–42, long, separated by a short gap from 1st, not as high as 1st, deeply emarginate ⅔ of way back, rear section higher than 1st section; caudal weakly concave; anal (1), 39–42, under and almost a mirror image of 2nd dorsal in size and shape, its origin immediately behind vent; pectorals, thoracic, origin a short distance behind gill opening, approximately ⅔ length of head; pelvics, ventral and slightly in front of pectorals, similar in shape but smaller than pectorals. Lateral line prominent, double in appearance. Scales small, 112–130 on side, 103–130 in lateral line.

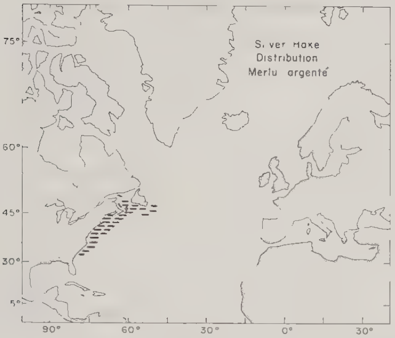


Colour, silvery iridescent when fresh from water, but soon fading to brownish or dark-gray above; lower part of sides and belly silvery; axil and edge of pectoral fins blackish; inside of mouth dusky-blue.

Distinctions: The silver hake closely resembles other members of the cod family. Having only two dorsal fins and one anal fin it is readily separated from the cod, haddock, pollock, and tomcod, all of which have three dorsal and two anal fins. It can be distinguished from the true hake, that have the same number of unpaired fins, by its normal pelvic fins; the pelvic fins of the true hake are modified into long, slender feelers. It differs from all the cod family by its lack of a barbel on the lower jaw. It is distinguished from the offshore silver hake (*Merluccius albidus*) by having more anal rays and gill rakers and fewer scales in the lateral line. *Merluccius bilinearis* has 39–42 anal rays, 15–22 gill rakers on the first arch and 103–130 scales; *M. albidus* has 36–41 anal rays, 9–11 gill rakers, and 130–148 scales.[52, 163]

Size: Up to a length of 30 inches and a weight of 5 pounds.

Range: The silver hake occurs on the continental shelf of eastern North America from the southern and eastern part of the Gulf of St. Lawrence and from southern Newfoundland to off South Carolina. A closely related species (*M. albidus*) is present from Georges Bank southward, overlapping areas occupied by the present species beyond the 50-fathom line.[52] It is represented in the Gulf of Mexico and on the coast of South America by other closely related species of *Merluccius*[163] and in Europe by *M. merluccius.*



Canadian distribution: The silver hake occurs sparingly in the southern Gulf of St. Lawrence, having been reported from the Miramichi estuary[314] and from nearby points; near Cape Bear, Prince Edward Island, and at Cheticamp, Nova Scotia,[95] and one was found near Mabou, Nova Scotia; reported as occasional from Chaleur Bay, Miscou and Magdalen islands and from the west coast of Newfoundland.[314] Taken at Bay Bulls, Newfoundland, southern Grand Bank and Banquereau.[17, 18, 19] Common on the banks off Nova Scotia; and in the Bay of Fundy, as far as the entrance to Minas Basin.[205]

Biology and Economics: The silver hake occurs in a variety of depths, from the very shallowest water, where it sometimes strands, to depths of over 500 fathoms. Those living in the deeper water pursue their food in a pelagic fashion, coming near the surface, chiefly at night. Their frequent capture, in quantity, in otter trawls indicates that they are often on or near bottom.

The silver hake prefers warmer water than most members of the cod family and is most abundant in summer. While its wintering grounds are not known there is some evidence that it moves either into deeper water or farther south in winter. It is rarely caught where the water temperature is less than 38 F. The trend towards warmer water temperatures in the period from 1937 to 1950 has resulted in increased catches of silver hake in the Georges Bank area and in a year-round fishery there.[460] It has also permitted a northward extension of the range to the Gulf of St. Lawrence.

The silver hake spawns over a wide area from Middle Ground and Sable Island Bank, off Nova Scotia, to off Cape May at the mouth of Delaware Bay. North of Cape Cod spawning occurs from June to September. The Canadian Fisheries Expedition, 1914–15, found many silver hake eggs at various points off the Nova Scotia coast from Middle Ground and Sable Island Bank westward, some of them outside the continental shelf.[102] They were taken in July but not in May. Presumably that expedition was too early to take the newly hatched fry, but moderate numbers of fry were taken in August and September 1954, in much the same area, extending it slightly eastward to include Canso Bank and western Banquereau. No eggs nor larvae have been taken in the Gulf of St. Lawrence. Nor is there any evidence of successful breeding in the Bay of Fundy where the water may be too cold.

The eggs are buoyant, transparent and spherical (about $\frac{1}{32}$ inch in diameter); they have a small yellowish or brownish oil globule. They hatch in a few days, the resultant fry being only $\frac{1}{8}$ inch long.

Little is known of the age and growth of the silver hake in Canadian waters; in the Georges Bank area they reach a length of from 1 to 3 inches by the first autumn; 2½–6½ inches by the next April and 9½–11 inches at 2 years old.[49]

Silver hake are voracious, at times feeding heavily on the young of other fishes, such as herring, alewives, mackerel, silversides, smelt, butterfish, sand lance, and myctophids, but also eaten in quantity are squid and crustaceans, such as euphausiids and decapods.

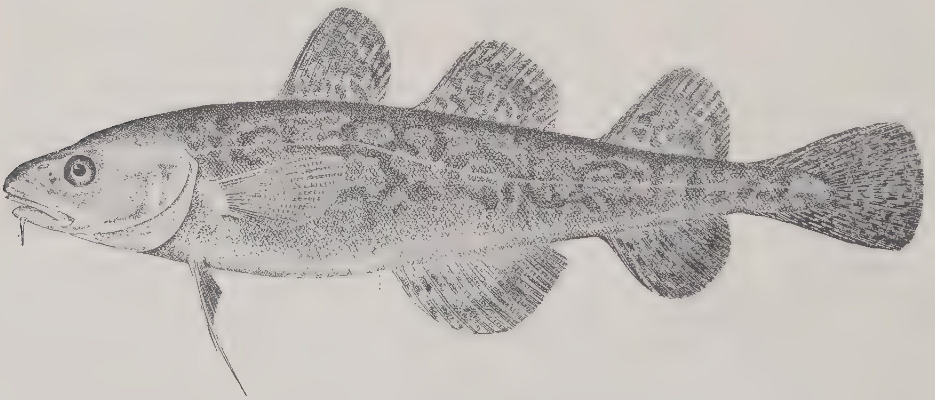
While considerable numbers of silver hake are caught off the Nova Scotia coast, they are either discarded or used for the manufacture of fish meal; no account is taken of the quantities. Although tasty, the flesh becomes very soft in a short time. In the United States up to 70 million pounds have been utilized annually in recent years, a development since the year 1900.

Atlantic tomcod — Poulamon atlantique

Microgadus tomcod (Walbaum) 1792

OTHER COMMON NAMES: frostfish, snig,[200] petite morue, loche, poisson des chenaux

DESCRIPTION: Body moderately elongate, only slightly compressed; depth 5 in total length, greatest under 1st dorsal fin. Head 4⅗ in total length, upper jaw projecting, snout rounded, barbel on lower jaw, its length equal to diameter of eye; angle of mouth under middle of eye.



Eye 5½–6 in head. Fins: dorsals (3), moderately high, rounded, rays 11–15, 15–19, 16–21, definite spaces between bases; caudal convex, rounded; anals (2), 12–21, 16–20, inserted below 2nd and 3rd dorsals; pectorals large, inserted on sides below lateral line and behind operculum; pelvics inserted ventrally, slightly in front of pectorals, their 2nd ray prolonged to twice length of other rays, giving these fins a feeler-like appearance. Lateral line present. Scales small.

Colour, olive-brown with green or yellow tinges on upper parts, darkest on back, paler on sides; upper part of sides, back and dorsal fins mottled with indefinite black spots or blotches; belly grayish or yellowish-white; anal fins olive at margins.

DISTINCTIONS: The Atlantic tomcod may be distinguished from the cod by its rounded tail, its filamentous pelvic fins and its smaller eye; the cod has a square or concave tail, the 2nd ray of the pelvic fins is not prolonged more than $\frac{1}{4}$ of the fin length and the eye, in comparable-sized cod, is about 4 in the head.

SIZE: Maximum length 15 inches, but rarely over 13 inches.

RANGE: Southern Labrador to Virginia in coastal and brackish waters. Occasionally in fresh water. A related species occurs on the Pacific coast of North America.

Canadian distribution: Known from Hamilton Inlet and Lake Melville, Labrador;[25] abundant in winter in Pistolet Bay, Newfoundland;[209] found in coastal waters and estuaries of the Gulf of St. Lawrence and in the river as far as Quebec City[93, 95, 334, 450, 514] but most numerous in the Miramichi estuary; more numerous in the estuaries of the Bay of Fundy.[205] It is landlocked in Lake St. John, Saguenay County, Quebec,[262, 538] and in Deer Lake, Nfld.[427]

BIOLOGY AND ECONOMICS: The tomcod is limited to coastal waters and estuaries, never straying far from shore. It runs up to the head of tide in many rivers and streams in December and January, when spawning takes place. Occasionally it goes well up into fresh water, having been reported 12 miles above head of tide in the Petitcodiac River, New Brunswick.[49]

The eggs are spherical, $\frac{1}{16}$ inch in diameter, and are deposited on bottom in streams where they adhere to rocks, debris, etc. The eggs have a conspicuous oil globule. Like most fish eggs, they can tolerate a range of salinity and the tomcod eggs hatch equally well in fresh water and in salinities up to one-half that of ordinary sea water. They hatch in from 22–35 days at 40 F and in about double this period at 32 F. The young fry remain in brackish water in the rivers for some months and the larger ones are $2\frac{1}{4}$ inches long by August.

The larger tomcod in Minas Basin eat amphipods, annelids, hermit crabs, sand shrimp, and occasionally small fishes, including smelt and striped bass.

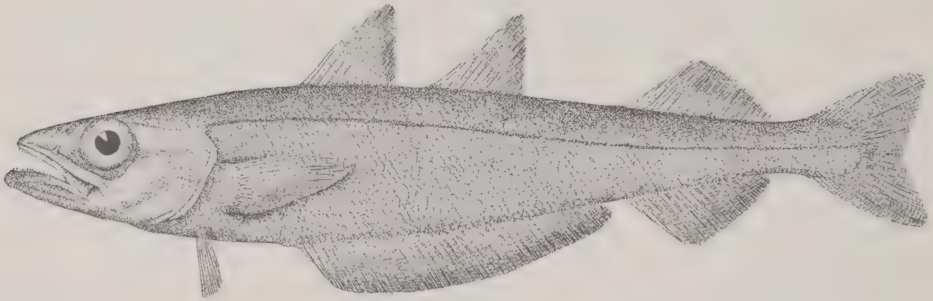
Tomcod have limited use as human food and are chiefly valuable as food for foxes and other animals. Efforts are made to catch them in northern New Brunswick and Quebec. They are taken along with smelt in traps and may be caught by hand line and by various types of hoop net. It is the object of a winter ice fishery in the St. Lawrence River, especially around Trois Rivières.

The catch of tomcod from the Canadian Atlantic area for 1962 was 1,208,000 pounds, with a value of $26,000.[70b]

Blue whiting **Poutassou**

Micromesistius poutassou (Risso) 1826

DISTINCTIONS: Blue whiting may be distinguished from other gadids with 3 dorsal and 2 anal fins (which includes cod, tomcod, haddock, and pollock) since it has no barbel and the lower jaw projects beyond the upper. Of all the gadids with 3 dorsal fins the blue whiting most closely resembles the pollock. Both this species and the pollock have protruding lower jaws while the others (cod, tomcod, and haddock) do not. In the blue whiting the 1st anal fin extends far forward and the origin of the anal fin is anterior to the origin of the first dorsal, whereas in the pollock the origin of the 1st anal is located under the origin of the 2nd dorsal fin. The pollock usually has a chin barbel but the blue whiting does not.



SIZE: This fish has been reported only a few times from Canadian waters. The largest specimen to date was about 12 inches in length.

RANGE: On the European side of the Atlantic the blue whiting is rather widely distributed from northern Norway southward to the Mediterranean, but it has only recently been reported from North American waters.

Canadian distribution: The first western Atlantic records of a total of four specimens, one taken in 1952 and three taken in 1953, off Georges and Browns banks, were reported by Bigelow and Schroeder.[52] An additional five specimens were taken on Cruise 52 of the *A. T. Cameron* in 1962 and reported by Scott.[424]

BIOLOGY AND ECONOMICS: The blue whiting is a deep-water species, inhabiting waters of about 150–280 fathoms, but it appears to be such a recent arrival in the western North Atlantic that its life history there is not known.

At present it is a rare species of no commercial importance.

KEY to Species of MOLVA

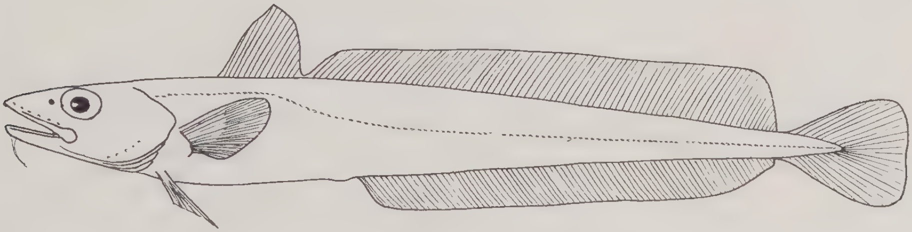
Rays in 2nd dorsal fin 69–83; anal rays 70–81; 1st dorsal base into 2nd dorsal base 5.3–7.5 times; colour uniformly gray to gray-brown and without mottling; median fins without white edging; no dark spot at posterior edge of 1st dorsal fin .... Blue ling, *Molva byrkelange* (p. 211)

Rays in 2nd dorsal fin 59–70; anal rays 57–66; 1st dorsal base into 2nd dorsal base 3.5–4.5 times; colour usually brown with distinct marbling; median fins with distinct white edging; a dark spot at the posterior edge of 1st dorsal fin .... European ling, *Molva molva* (p. 211)

Blue ling **Lingue bleue**

Molva byrkelange (Walbaum) 1792

The first record for this species from the western North Atlantic, outside of Greenland waters, was the report of a 45-inch (115-cm) long specimen, taken in 130 fathoms at the mouth of Hermitage Bay on the south coast of Newfoundland on September 17, 1959. The report by Templeman and Squires[480] contains a very thorough description of the specimen.

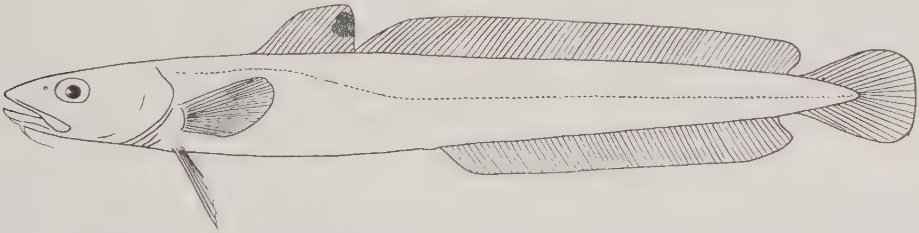


The blue ling is distributed in deep water from northern Norway and Iceland into the Kattegat (between Denmark and Sweden), southward at least to the Faroes and westward to the West Greenland banks. The capture off southern Newfoundland thus extends considerably the range in the western North Atlantic.

European ling **Julienne**

Molva molva (Linnaeus) 1758

Description: Body long and slender, greatest depth 12–13.5 in total length, occurring at the tip of the pectoral fin, decreasing slightly posteriorly until just before end of 2nd dorsal, then decreasing rapidly to a point, no distinct caudal peduncle, body slightly compressed. Head 4.8 in total length, pointed, mouth terminal, lower jaw bearing a barbel, whose length is 4 in head, angle of mouth under pupil of eye, rows of small teeth in jaws with an inner row of larger, widely spaced teeth on lower jaw and on vomer. Eye moderate, oval, horizontal diameter 4.5–5 in head. Fins: dorsals (2) 1st 13–16, middle rays longest, 3.5 in head, fin rounded, base 2 in head, fin begins about its own length behind gill opening, 2nd dorsal 60-70, rounded at both ends, otherwise uniform and equal to 1st dorsal in height, fin begins immediately behind 1st dorsal and ends just before caudal, its base 4.5 times as long as that of 1st dorsal; caudal distinct, moderate, rounded; anal (1) 57–66, similar in height and shape to 2nd dorsal, originating under 10th ray of 2nd dorsal and ending at same point as 2nd dorsal; pectorals moderate, longest rays 2½ in head, rounded, base midway between lateral line and ventral edge



and a short distance behind gill opening; pelvics narrow, first ray longest being 2 in head, located ventrally, base under gill opening and in front of base of pectoral, end of fin under middle of pectoral. Lateral line almost straight from above gill opening to tip of tail. Scales very small, covering body, head, and part of fins.

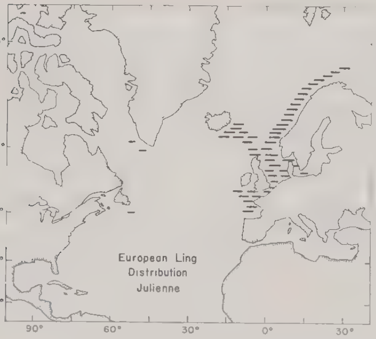
Colour, brown or dark on back, sides lighter with black and brownish bands and blotches; belly pale or white. Vertical fins with white edges and a black spot on posterior edge of each.

DISTINCTIONS: The European ling differs from the white hake, squirrel hake, and spotted hake in its more slender body and relatively short nonfilamentous pelvic fins; the latter do not reach beyond the middle of the pectorals. It has no prolongations of the first dorsal fin such as the longfin hake and the blue hake possess. Its form resembles the fourbeard rockling but the first dorsal fin and pointed head distinguish it at once. It is separated from other species of the same genus, that occur in Europe, by the length of the pelvic fin, by its longer head, contained less than five times in the body length and by the white edging of the vertical fins.

SIZE: Up to a length of 79 inches and a weight of 88 pounds.

RANGE: The European ling, a typical deep-sea fish, is not common to the Atlantic waters on the North American coast. One specimen only has been recorded from the Grand Bank, that taken in 1953.[475]

Jensen[221] reports the examination of two ling from south Greenland. In the eastern North Atlantic it extends from Iceland, the Faroes and the Murman coast, to the Bay of Biscay, penetrating into the western Baltic Sea.



Canadian distribution: While the European ling was said to occur in deep water off Newfoundland, no definite record could be located[170] until a specimen was landed by the trawler *Zibet* on February 9, 1953. It was 54 inches long, weighed 37½ pounds, and was caught on the southwestern part of the Grand Bank at lat 44°43′N, long 53°19′W, in 48–55 fathoms.[475]

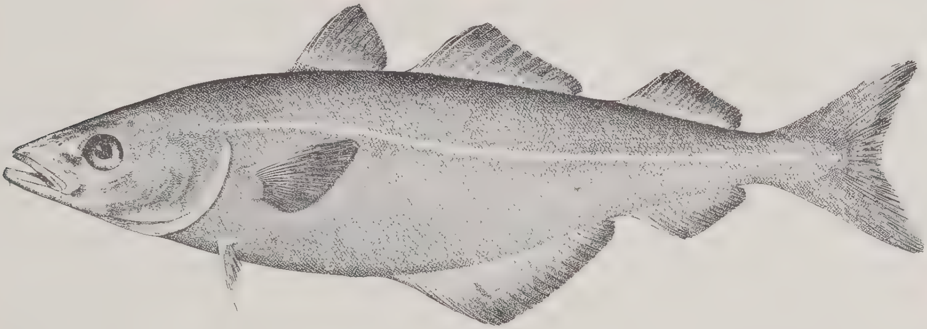
BIOLOGY AND ECONOMICS: In Europe this species spawns from March to June. Females produce up to 5 million eggs. The eggs are spherical, .040–.045 inch in diameter, with a single oil globule, and they float in the water.[458]

Pollock — Goberge

Pollachius virens (Linnaeus) 1758

OTHER COMMON NAMES: pollack, Boston bluefish, blister-back, merlan noire, merlan, colin

DESCRIPTION: Body fusiform, slightly deeper than thick, greatest depth 4⅓ at 1st dorsal fin; caudal peduncle moderately stout. Head 4 in length, snout pointed, lower jaw projecting; angle of mouth does not reach level of eye; small, equal teeth in jaws; very small barbel on lower jaw in young, disappearing in older fish. Eye 6 in head. Fins: dorsals (3), 1st 13–14, highest, 2nd 21–22, longest of dorsals, 3rd 19–20; caudal slightly forked; anals (2), 1st 24–28, 2nd 20–21, situated under 2nd and 3rd dorsals, 1st anal originating under posterior part of 1st dorsal; pectorals moderate, on sides behind operculum, reaching to level of middle of 1st dorsal; pelvics smaller, located below and in front of pectorals. Lateral line straight. Scales small.

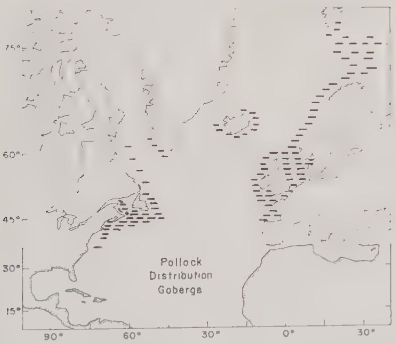


Colour, brownish-green above, paling to yellowish, smoky-gray or green on sides and silvery-gray on belly. Lateral line white or gray. Dorsal, caudal, anal, and pectoral fins olive; pelvic fins white with reddish tinge. Colours uniform, gradually fading into one another.

Distinctions: The pollock is distinguished from the cod, tomcod, and haddock by its forked tail, projecting lower jaw and greenish or bluish colour and absence of spots. Its body is much heavier than that of the polar cod and the chin barbel is smaller or obsolete.

Size: An average weight of 7–10 pounds is usual but the species may attain lengths up to 42 inches and a weight of 60–70 pounds; however, usually not over 36 inches and 15 pounds.

Range: Found on both sides of the North Atlantic. From southern Sandwich Bay, Labrador, southern Newfoundland and Grand Bank and from the southern Gulf of St. Lawrence to New Jersey and occasionally to North Carolina. Rare beyond New York and specimens caught as far north as Hudson and Davis straits.[55] West Greenland, Spitzbergen, Iceland, Barents Sea, northwestern Europe, including the North Sea, to the Bay of Biscay.



Canadian distribution: Southern Labrador in commercial quantities; it occurs in variable numbers in the Gulf of St. Lawrence, being reported from Miscou, New Brunswick, Magdalen Islands to Cheticamp, Nova Scotia, Miramichi estuary, Malpeque, Prince Edward Island, and Northumberland Strait;[95, 450] Ile Verte and Kamouraska;[511] abundant off southern Newfoundland; also about the mouth of the Bay of Fundy. Offshore they are caught on Middle Ground, Misaine, Sable Island, Emerald, LaHave, and Browns banks.

BIOLOGY AND ECONOMICS: Tagging studies in European waters indicate that pollock may move for great distances. In our waters fish tagged off Campobello and Grand Manan islands have been shown to move south to Cape Cod over winter and return in spring.

Spawning does not occur in the Bay of Fundy and little is known of this phase of the life of Canadian pollock. It is likely that spawning occurs off Nova Scotia. In Massachusetts Bay pollock spawn from November to January. An average female produces about 220,000 eggs, although large pollock will yield up to 4 million eggs. The eggs are spherical, about 1 mm in diameter, and are buoyant in sea water. They hatch in about 9 days at 43 F and in 6 days at 49 F.

Studies of the growth of pollock in the Bay of Fundy[290] indicate that yearling pollock are 2¾–3½ inches long; 2-year-olds are 11–12½ inches; 3-year-olds are 15 inches; 5-year-olds average 25 inches, and 6-year-olds average 26¾ inches in length. Some of the largest pollock were 8 years old.

Pollock are voracious feeders, large fish feeding predominantly on other fishes. In general, inshore fish eat small crustaceans, mainly amphipods, while offshore pollock eat mostly fish. Euphausiids are most important in the diet of pollock in the Bay of Fundy. The fish most frequently found in pollock stomachs is the sand lance but small plaice, myctophids, and hake are also common at times.

Pollock are important commercially and are caught on line trawls, hand lines, in otter trawls, and purse seines. The catch of pollock from the Canadian Atlantic area for 1962 was 60,936,000 pounds, with a value of $1,655,000.[70b]

United States fishermen catch pollock on the banks off Nova Scotia as do ships from some European countries.

Pollock are used fresh, salted and dried, smoked and canned.

KEY to Species of UROPHYCIS

1 Pelvic fin filaments very long, the first extending nearly to the end of the anal fin, the 2nd extending well beyond anal fin origin .... Longfin hake, *Urophycis chesteri* (p. 215)

Pelvic fin filaments not reaching origin of anal fin or, if so, overlapping only first few rays 2

2 First ray of first dorsal fin not prolonged into a filament, upper half of this fin black with white edging; lateral line interrupted by whitish spots .... Spotted hake, *Urophycis regius* (p. 216)

First ray of first dorsal fin prolonged into a filament 3

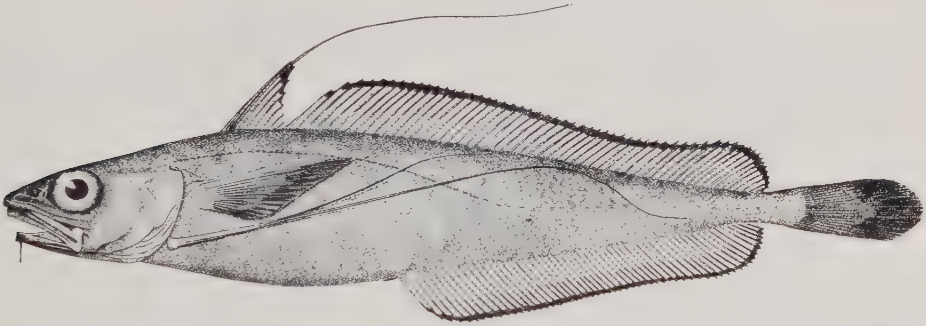
3 Scales on body in about 140 rows; posterior angle of mouth extending to vertical through posterior margin of orbit of eye .... White hake, *Urophycis tenuis* (p. 217)

Scales on body in about 110 rows or fewer; posterior angle of mouth extending to vertical through posterior margin of pupil of eye .... Squirrel hake, *Urophycis chuss* (p. 217)

Longfin hake **Merluche à longues nageoires**

Urophycis chesteri (Goode and Bean) 1878

DESCRIPTIONS: Body elongate, greatest depth 6 in total length at origin of 2nd dorsal, tapering thence to the small caudal peduncle. Head pointed, 5½ in total length; upper jaw projecting; small barbel on lower jaw; angle of mouth under pupil of eye. Eye large, 3½ in head. Fins: dorsals (2), 1st 9–10, 3rd ray greatly prolonged and 5 times the length of the next longest ray, otherwise the fin is triangular, 2nd 55–57, a little higher at either end than in middle, these 2 fins extend from above the base of the pectorals to the caudal peduncle; caudal rounded; anal (1) 56, almost uniform in height, extending from vent, under 12th ray of 2nd dorsal, to caudal peduncle; pectorals moderate, pointed, situated on mid-side behind gill opening, reaching to below 7th ray of 2nd dorsal; pelvics very long and filamentous, the longest ray almost reaches posterior part of anal fin, the next longest ray reaches 13th ray of anal fin. Lateral line broadly arched in its first half, broken in its posterior half. About 90 rows of scales between gill opening and base of tail.



Colour, olive above and on sides; belly silvery-white; fins same colour as back with dusky markings on edges.

DISTINCTIONS: The longfin hake may be distinguished by its very long pelvic fins; the posterior part of the body is more slender than that of the white hake and the spotted hake. The long dorsal filament is distinctive in comparison with the spotted hake. The almost uniform anal fin distinguishes it from the blue hake, whose anal is deeply indented.

SIZE: Up to 15 inches in length.

RANGE: An abundant fish on the continental slope of eastern North America, in depths of over 100 fathoms; extending from the mouth of the Laurentian Channel to off North Carolina.

Canadian distribution: Probably more numerous offshore than the three existing records suggest. It was recorded from off Sheet Harbour, Nova Scotia, in 127 fathoms (lat 44°26′N, long

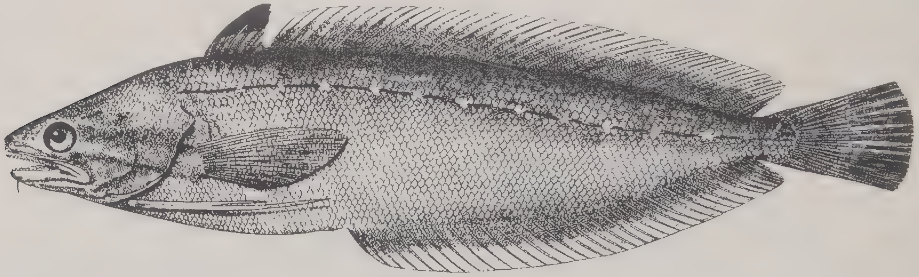
62°10′W) and twice from deep water (201 and 224 fathoms) between St. Pierre Bank and Banquereau (lat 44°58′N, long 56°21′W) and nearby.[170] Twenty specimens were taken off Sable Island during experimental otter trawling by the *A. T. Cameron* in March 1962, and are retained in the collection of the Royal Ontario Museum (cat. no. 21,800).

BIOLOGY AND ECONOMICS: The longfin hake is a bottom fish that lives in depths of 100–550 fathoms. It spawns in summer and autumn.[49]

Spotted hake — Merluche tachetée

Urophycis regius (Walbaum) 1792

DESCRIPTION: Body rather elongate, compressed; greatest depth, 5 in total length, under origin of 2nd dorsal. Head slightly depressed, 4½ in total length, snout blunt, mouth large, its angle slightly behind eye, upper jaw projecting slightly, small barbel on lower jaw, small teeth on jaws and vomer. Eye 6 in head, slightly more than its diameter from snout. Fins: dorsals (2), 1st 8–9, triangular, equals height of 2nd dorsal, 2nd 46–51, uniform in height extending from 1st dorsal to caudal peduncle; caudal rounded; anal (1) 43–49, uniform in height and about equal to dorsal, extending from vent to caudal peduncle, its origin under 8th ray of 2nd dorsal; pectorals large, on sides behind gill opening, extending to region of vent; pelvics ventral and inserted well in front of pectorals, filamentous with 2 rays, the longer almost reaching vent. Lateral line prominent. Scales in 90–95 rows between gill opening and base of caudal.



Colour, pale brownish, tinged with yellow; lateral line dark brown, interrupted by white spots; upper half of 1st dorsal black with white edging, 2nd dorsal olivaceous with irregular, round, dark spots; pelvics and lower edge of pectorals white; several round, dark spots on sides of head.

DISTINCTIONS: The spotted hake differs from the white hake in its lack of a filamentous ray in the 1st dorsal; pectoral fins reach the vent, while those of the white hake fall considerably short of it. It has 90–95 scale rows on the sides as compared to 105–140 rows in the white hake. The pelvic fins are much shorter than in the longfin hake.

SIZE: Up to 16 inches long and a weight of 1½ pounds.[49]

RANGE: Atlantic coast of North America from the neighbourhood of Sable

Island to off northern Florida. It is considered to be abundant from New York to Cape Hatteras, occurring in depths of up to 167 fathoms.

Canadian distribution: There are only two records, probably both strays. The first record is vague as to location "off Halifax."[381] Another specimen was reported in August 1931, northeast of Sable Island at lat 44°10′N, long 59°45′W.[17]

BIOLOGY AND ECONOMICS: Where this species is more abundant it is reported as being a winter spawner. It east fishes and crustaceans, including alewives, menhaden, lance, squid, mysids, and shrimp.[49]

White hake* **Merluche blanche**

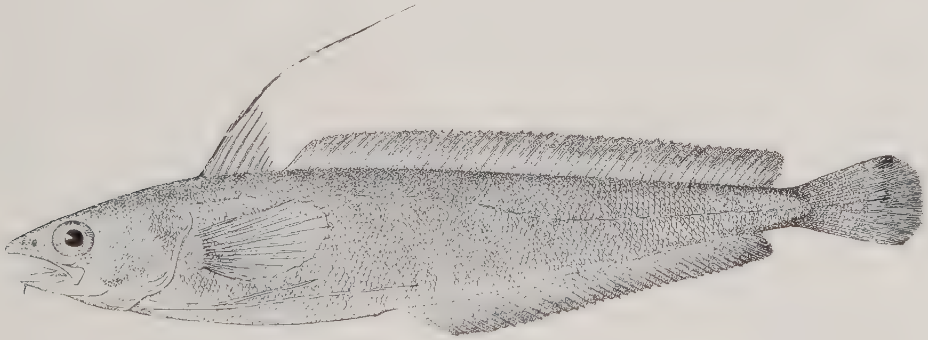
Urophycis tenuis (Mitchill) 1815

Squirrel hake* **Merluche-écureuil**

Urophycis chuss (Walbaum) 1792

OTHER COMMON NAMES: white hake, red hake, squirrel hake, mud hake, ling, merluche, lingue

DESCRIPTION of *U. chuss:* Body rounded in front of vent, somewhat compressed behind, depth 5½, greatest at origin of 2nd dorsal fin, tapering uniformly to caudal peduncle. Head pointed, upper jaw projecting, small barbel on lower jaw, angle of mouth under back of eye. Eye large, 4½ in head. Fins: dorsals (2), 1st 9–10, triangular, 3rd ray at least twice as long as others, 2nd 54–57, long and lower than 1st dorsal, extending almost to caudal fin; caudal relatively long, rounded; anal (1), 48–50, low and uniform in height, extending from vent to caudal peduncle, its origin under 1st quarter of 2nd dorsal; pectorals large, on sides behind gill opening, reaching 3rd ray of 2nd dorsal; pelvics inserted below and well in front of pectorals,



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* Many authorities recognize 2 species of hake, *U. tenuis* (white hake) and *U. chuss* (red or squirrel hake). They are said to differ mainly in the number of rows of scales between the gill opening and the base of the caudal fin, in the length of the filamentous dorsal ray, in the length of the pelvic fins, and in the position of the posterior angle of the mouth. Canadian specimens show so much variation and overlapping in the first three of these characters that Vladykov and McKenzie[513] and Battle[31] considered *U. tenuis* and *U. chuss* to be one species. Because of the resulting confusion, the two species are here treated together, except for the description which applies only to *Urophycis chuss*. It is probable that *U. tenuis* is more common in Canadian waters.

reduced to 2 much elongated feeler-like rays, the lower and longer reaching to or slightly beyond vent. Lateral line present. Scales 110–140, moderate in size.

Colour, varies considerably, the back usually reddish to muddy-brown with slight metallic reflections on the cheeks and dark patches, mixed with gray, beneath the eyes; belly pale gray, yellowish or white, sometimes sprinkled with fine black dots.

DISTINCTIONS: Hake are distinguished from cod, haddock, tomcod, and pollock, by having 2 dorsals and one anal fin. The slender pelvic fins distinguish them from silver hake. The filamentous ray of the 1st dorsal separates them from the spotted hake, which has none. The filamentous pelvic fins are much shorter than those of the longfin hake.

SIZE: Up to a length of 53 inches and a weight of 47¼ pounds.[399] Specimens over 30 inches long are uncommon.

RANGE: Coastal region of the northwestern Atlantic from southern Labrador, the Gulf of St. Lawrence, and southern Grand Bank to North Carolina. From shallow water to over 500 fathoms.

Canadian distribution: Reported in 1891, but not since, near Battle Harbour and off St. Michael Bay, southern Labrador.[240] Found sparingly on southwestern edge of Green and Grand banks.[17, 18, 19] Abundant in southern Gulf of St. Lawrence and occurring up the St. Lawrence estuary as far as Trois Pistoles, Quebec.[514] Common at Cheticamp, Nova Scotia, and Magdalen Islands, Quebec.[95] Common along the outer coast of Nova Scotia. Most abundant in lower part of Bay of Fundy but occurring to the head of that Bay and penetrating into Kennebecasis Bay and the Annapolis Basin.[205] Offshore, small catches are made on the following banks: Canso, Banquereau, Misaine, Middle Ground, Sable Island, Emerald, LaHave, and Browns.

BIOLOGY AND ECONOMICS: Hake are more stationary than cod or haddock and tolerate a wider temperature range (33–70 F for young; 33–50 F for mature fish). They avoid water with a temperature of 32 F or less. In agreement with these figures, small hake, 2–6 inches long, are often seen in midsummer close to shore; at the same time similar sizes are found living inside the shells of scallops in deeper water. This association of certain sizes with scallops is a widespread and well known one. Hake are caught through the ice in winter, in estuaries such as Kennebecasis Bay, New Brunswick.

The spawning season is midsummer in the southern Gulf of St. Lawrence, probably early autumn in southeastern Nova Scotia and winter or spring at the mouth of the Bay of Fundy.[31] The eggs are spherical, about .030 inch in diameter; when spawned they contain several oil globules but these tend to coalesce into one or two as development proceeds. The eggs float in sea water as do the resultant fry. They go to bottom at lengths of from 3 to 5 inches and are ground fish thereafter, except for brief excursions, when they may pursue food to the surface.

Hake are more abundant on soft muddy bottom than they are on hard bottom.

Growth studies on hake have been confined to the first 3 or 4 years. In the Bay of Fundy they reach a length of 8 inches in 1 year; 13–14 inches in 2 years, and 16–19 inches in 3 years. Females grow slightly faster than males.[100]

Crustaceans make up a large part of the food of hake. The smaller ones eat copepods and amphipods while larger hake feed on euphausiids, amphipods, prawns, other decapod shrimp, as well as on small fishes, including silversides, sticklebacks, tomcod, herring, mackerel, lance, alewives, and sculpins. While they eat squid, shelled molluscs are only taken rarely. Mussels, periwinkles, and marine worms have been found in hake stomachs on rare occasions.[30]

The catch of hake has varied with market demands. From 1911 to 1930 over 73% of the Canadian catch was made in the lower Bay of Fundy where the product was salted and dried, mostly for export. With a decline in this market the location of the main fishery has shifted.

The catch of hake from the Canadian Atlantic area for 1962 was 18,991,000 pounds, with a value of $451,000.[70b]

Hake are caught by means of otter trawls, line trawls, and handlines.

They are used fresh to a small extent but most of the catch is either salted and dried or canned. The livers yield a valuable oil and the sounds (air-bladders) are used in the manufacture of gelatin.

Family MACROURIDAE Grenadiers

This family of fishes is worldwide in distribution, living near the sea bottom from the Arctic to the Antarctic. Some live in the great or abyssal depths, others on the continental slopes and some are pelagic, that is, they swim off bottom in the upper layers of the ocean.

Although they are closely related, macrourids differ from the Gadidae or typical cods in the following ways: in the macrourids there is no caudal fin; the dorsal and anal fins terminate in a distinct point, there is often a spine in the first dorsal fin and there are differences in the association of olfactory lobes to the brain. In general shape they have large heads and the body then tapers rather uniformly to a point (hence the name "rat tail").

At least seven species have been reported to occur off the Canadian coast, of which five are here considered in detail.*

KEY to Family MACROURIDAE

1 Snout greatly prolonged, its length nearly twice eye diameter; scales along base of dorsal and anal fins enlarged and scute-like .... Roughnose grenadier, *Trachyrhynchus murrayi* (p. 225)

Snout length about equal to the eye diameter; scales along bases of dorsal and anal fins not conspicuously scute-like 2

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* *Macrourus holotrachys* Günther 1878, was reported by Halkett[184] to occur on the Newfoundland banks.

2 First dorsal fin spine smooth .... Longnose grenadier, *Coelorhynchus carminatus* (p. 220)

First dorsal fin spine long and serrate 3

3 Anus surrounded by scaleless, black skin and located near pelvic fins; branchiostegal rays 7 4

Anus not surrounded by scaleless, black skin and not located near anal fin; branchiostegal rays 6 5

4 Scales small, present along 4 lower branchiostegal rays; pyloric caecae 60 or more .... American straptail grenadier, *Malacocephalus occidentalis* (p. 223)

Scales moderate, absent from branchiostegals and gular region; pyloric caecae less than 30 .... Marlin-spike, *Nezumia bairdi* (p. 223)

5 First rays of 2nd dorsal fin in front of anal fin origin; pelvic fin rays not produced; scales large and strong .... Roughhead grenadier, *Macrourus berglax* (p. 221)

First rays of 2nd dorsal fin behind origin of anal fin; first pelvic fin ray produced; scales moderate .... Rock grenadier, *Coryphaenoides rupestris* (p. 220)

Longnose grenadier **Grenadier à long nez**

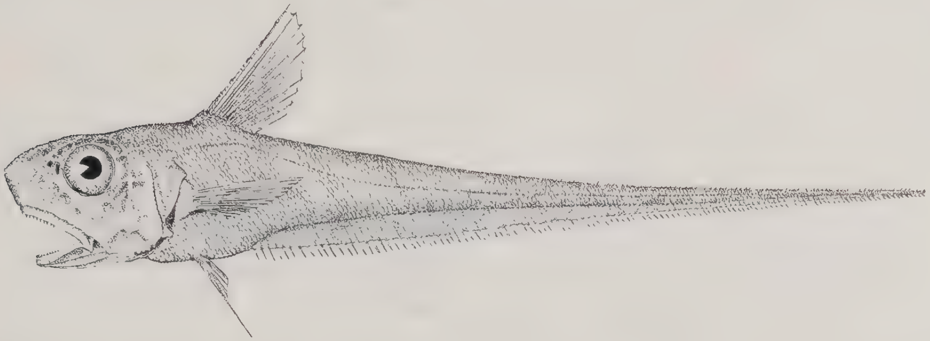
Coelorhynchus carminatus (Goode) 1880

This species has been reported by Bigelow and Schroeder[49] to occur "along the continental slope to abreast of southern Nova Scotia in depths of 104 to 464 fathoms." Its occurrence in this general region was further substantiated by Schroeder's[52] report in which the species was reported to occur in less than 200 fathoms in the region of the eastern slope of Georges Bank southward to Nantucket. We have no further evidence of its occurrence but it is obvious that it enters the southern part of the regions being considered.

Rock grenadier **Grenadier de roche**

Coryphaenoides rupestris Gunnerus 1765

Description: Body elongate, rounded in front, strongly compressed posteriorly and tapering gradually from the origin of the 1st dorsal to the tail, greatest depth 6½ in total length. Head compressed, 6 in total length, snout very blunt and projecting beyond mouth, upper profile convex; mouth on under side of head, its angle under posterior edge of eye, upper jaw longer than lower, small barbel on lower jaw, villiform teeth in both jaws, outer series in upper jaw enlarged, profile of lower side of head continuous from snout to isthmus. Eye large, ovate, greatest diameter almost vertical, 3¼ in head. Fins: dorsals (2), 1st II, 9–11, its origin above gill opening, height ¾ of head length, base ¼ head length, 2nd spine longest, finely serrated in front, 2nd dorsal 103–172, origin a distance behind 1st dorsal almost equalling height of latter, first rays very short, increasing in length towards tail and then decreasing; caudal none; anal 104–193, origin under posterior part of 1st dorsal, thence continuous to tail, longer and higher than 2nd dorsal; pectorals inserted on midsides under origin of 1st dorsal, length almost equals height of 1st dorsal; pelvics smaller, inserted below and slightly behind base of pectorals, first ray much produced, its total length 1⅓ times height of 1st dorsal. Lateral line indistinct.



Scales small, covering body and all parts of head, ctenoid; a small button-shaped plate with radiating ridges on point of snout. Vent immediately before origin of anal fin.

Colour, medium brown with fins deep brownish-violet.

DISTINCTIONS: The rock grenadier is distinguished by its blunt nose and the almost terminal position of the mouth; the other grenadiers have a more pointed snout, more definitely overhanging the mouth. The 1st pelvic fin ray is prolonged; the anterior rays of the 2nd dorsal are very short. The head is more completely covered with scales than in the other grenadiers. The position of the vent close to the anal fin distinguishes it from the marlin-spike and straptail grenadier.

SIZE: Up to a length of over 3 feet.[344]

RANGE: On both sides of the North Atlantic Ocean in 100–1200 fathoms. From off the tip of the Grand Bank to off Cape Hatteras.[344] Off Greenland, Iceland, the Murman coast, south to the Irish Sea and Skagerrak.

Canadian distribution: Reported from off the southern part of Banquereau many years ago; also from the southern tip of the Grand Bank (lat 42°55′N, long 50°51′W) in 471 fathoms. A specimen was caught south of Browns Bank at lat 41°47′N, long 65°37′W in 677 fathoms.[170] Recent investigations off Labrador and Baffin Island have revealed that this species is not uncommon in deep waters.

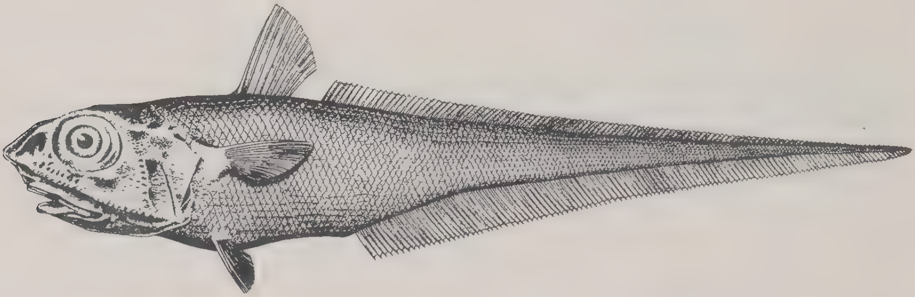
Roughhead grenadier — Grenadier berglax

Macrourus berglax Lacépède 1802

OTHER COMMON NAMES: smooth spined rat-tail, onion eye

DESCRIPTION: Body elongate, stout anteriorly, tapering to a point posteriorly, compressed behind vent; depth at 1st dorsal fin 5¾ in length. Head 4½ in total length, compressed, hexagonal in cross-section; upper profile convex, 4–6 ridges on top of head, snout projecting and overhanging mouth, lower jaw shorter than upper, angle of mouth under posterior edge of pupil of eye, prominent suborbital ridge runs from tip of snout to lower corner of operculum;

small barbel on lower jaw about one-tenth length of head; small teeth in irregular double row in lower jaw and in a band on upper jaw; upper parts of head covered with scales that do not overlap, larger on crests and ridges, smaller between, these scales armed with one or more rows of spines. Eyes large, oval, horizontal diameter 3 in head. Fins: dorsals (2), 1st I, 12, higher than long, first ray spine-like, with very fine teeth along it, situated above pectoral, 2nd about 124, extending from short distance behind 1st dorsal to posterior tip of body, front rays about ⅓ height of 1st dorsal, decreasing to much shorter posteriorly; caudal none; anal about 148, extending from vent to posterior tip of body, only slightly shorter than 2nd dorsal, rays longer than those of 2nd dorsal; pectorals moderate, inserted on middle of side behind gill opening, reaching almost to below beginning of 2nd dorsal; pelvics smaller, on ventral part of body, directly below pectorals. Body covered with small, firmly attached scales, each with a median keel of several spines.



Colour, ashy gray above and below, darker at posterior part of body; anal fin with narrow dark edge; pectoral and pelvic fins sooty.

DISTINCTIONS: The roughhead grenadier is distinguished from the marlin-spike by the arched dorsal profile of the head, by the ridges on the head, by the location of the vent immediately before the anal fin, and by the very fine teeth on the dorsal spine as compared to the strong teeth on the corresponding spine of the marlin-spike. Its jaws lack the mixture of large and small teeth that characterize the straptailed grenadier and the rock grenadier. Its anal fin begins behind the 2nd dorsal; the anal fin of the marlin-spike and of the straptail and rock grenadiers begins in front of the 2nd dorsal.

SIZE: Up to 36 inches long, but rarely over 30 inches.[49]

RANGE: Found along the coasts in deep water on both sides of the North Atlantic Ocean. Along the continental slope of North America south to Georges Bank. In Davis Strait, off southern Greenland, Iceland, Spitzbergen, and northern Norway.

Canadian distribution: Taken infrequently off Newfoundland and Nova Scotia. Reported from about 20 miles off Cape Bonavista, Nfld.,[5] in 130–180 fathoms. One was caught by a trawler, probably off Banquereau, in April 1951. One 35 inches long was caught off Rose Blanche, Nfld., in 100 fathoms, in winter.[17] Reported on Banquereau and Sable Island banks.[35, 513] Also from outside Browns Bank (lat 41°47′N, long 65°37½′W) in 677 fathoms.[170] Specimens now in the Museum of Comparative Zoology at Harvard University came from either LaHave or Banquereau and from Grand Bank many years ago.[49]

American straptail grenadier — Queue-de-rat d'Amérique

Malacocephalus occidentalis Goode and Bean 1885

DESCRIPTION: Body elongate, greatest depth at origin of 1st dorsal, 6⅓ in total length; tail long, slender, and compressed. Head small, not compressed, 6¼ in total length, dorsal profile slightly convex, snout projecting beyond mouth and ending in a short unicorn-like projection; mouth relatively large, subterminal, its angle under posterior edge of eye, a broad band of minute teeth in upper jaw with about 10 enlarged teeth in an outer row on each side, a single series of medium-sized teeth in lower jaw; a long, thin barbel, 2½ in head, on lower jaw. Fins: dorsals (2), 1st II, 11, its origin slightly behind the base of pectorals, its height 1½ in head, its base 3½ in head, second spinous ray serrated, projecting slightly, 2nd dorsal begins about 1½ times height of 1st dorsal behind it and extends to tail, its rays short; caudal none; anal begins under posterior part of 1st dorsal and extends to tail, longer and higher than 2nd dorsal; pectorals moderate, inserted on midsides and reaching about middle of space between 1st and 2nd dorsals; pelvics much smaller than pectorals, inserted under them, first ray slightly prolonged. Lateral line present. Body and head covered by small scales, each of which bears small spines. Vent a little behind bases of pelvics, in a scaleless area, a space between it and the origin of the anal.

Colour, very light with a dark area on middle rays of 1st dorsal; axil of pectorals dark; jaws, lips and upper part of barbel, dark.[344]

DISTINCTIONS: The straptail grenadier is distinguished from the roughhead grenadier by its anal fin which is longer than the 2nd dorsal and from the roughhead and rock grenadiers by the space between the vent and the origin of the anal fin. It is distinguished from the marlin-spike by its small, delicate scales and by having scales on the branchiostegal rays; the marlin-spike has larger, rougher scales and none on the branchiostegal rays. If not damaged the rostral projection on the snout is useful in identifying the straptail grenadier.

SIZE: Up to 12 inches in length.

RANGE: Off the eastern coast of North America from Banquereau to Grenada, West Indies, and in the Gulf of Mexico in 100–300 fathoms.[344]

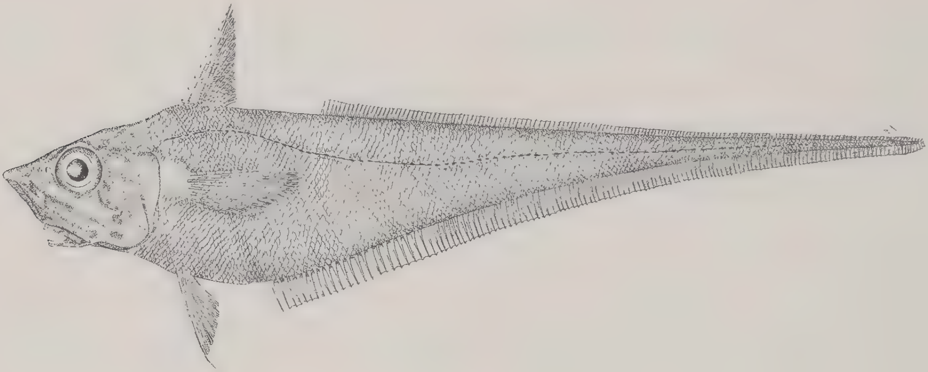
Canadian distribution: The only record for this species north of Cape Hatteras was one recorded by Goode and Bean off the eastern tip of Banquereau at lat 44°28′30″N, long 57°10′45″W, in 133 fathoms.[170]

Marlin-spike — Grenadier de Baird

Nezumia bairdi (Goode and Bean) 1877

OTHER COMMON NAMES: common rat-tail, common grenadier

DESCRIPTION: Body elongate, compressed behind vent, tapering from 1st dorsal fin to tip of tail, greatest depth 7½ in total length. Head 6½ in total length, dorsal profile almost straight, snout pointed and markedly overhanging mouth, suborbital ridge runs from tip of snout under eye, upper jaw slightly longer than lower; small barbel on lower jaw, not over one-tenth length of head; angle of mouth under posterior edge of pupil; uniform, conical, villiform teeth in bands on jaws. Eye large, 3½ in head. Fins: dorsals (2), 1st II, 11, the first ray very short, second ray longest, spinous and strongly toothed, this fin triangular, twice as high as long and height ⅘ length of head, 2nd, about 137, separated from 1st dorsal by a space about equal to height of 1st dorsal, it extends to tip of tail, rays very short throughout; caudal none; anal about 120, begins under posterior edge of 1st dorsal and extends to tip of tail, more than twice as high as 2nd dorsal; pectorals moderate, tips rounded, inserted on mid-sides behind operculum and extending to under middle of space between 1st and 2nd dorsal; pelvics smaller, pointed, inserted below and slightly in front of pectorals, 1st ray prolonged as a filament. Vent situated some distance in front of origin of anal fin. Lateral line present. Scales small, rough, covering body and much of head; several spines on each scale.



Colour, uniform gray or brownish-gray, sometimes silvery on sides; belly sometimes dark blue or blackish; under surface of snout pink; first dorsal pink; eyes dark blue.

DISTINCTIONS: The marlin-spike is distinguished from the roughhead grenadier by the coarse teeth on the 2nd dorsal spine and by the anal fin being longer than the 2nd dorsal; the 2nd dorsal is longer than the anal in the roughhead. The position of the vent some distance in front of the origin of the anal fin is diagnostic; it is immediately in front of the anal fin in the roughhead, the straptail, and the rock grenadiers. The 1st dorsal fin is distinctly triangular in the marlin-spike but not in the others.

SIZE: Up to 16 inches in length.

RANGE: Found in the western North Atlantic Ocean, in the deeper parts of the Gulf of St. Lawrence, and in the Bay of Fundy; along the continental slope from Grand Bank to the West Indies. Also reported from the Azores.[344]

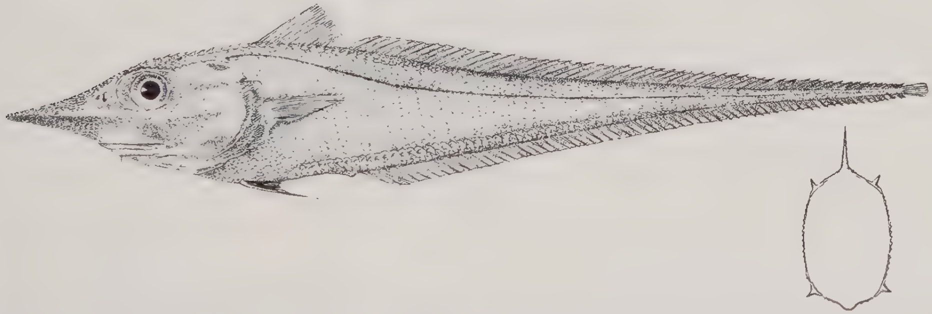
Canadian distribution: Found in the region of Trois Pistoles, Quebec.[357, 514] Caught off Fame Point, Que., in 100 fathoms in June 1953 (*J. J. Cowie* records). In Cabot Strait in 205 fathoms.[95] From the southwestern part of the Grand Bank.[19, 170] Between Green and Grand banks, mouth of Laurentian Channel, and off Banquereau.[170] Northwest of Sable Island Bank in 80–100 fathoms and west of Middle Ground at lat 44°25′N, long 61°30′W, in 80 fathoms.[304] One from north of LaHave Bank at lat 43°34′N, long 63°56′W.[170] The Bay of Fundy records are from shallower water and adjacent to Canada; one from near Eastport, Maine,[260] and one from a weir at Lubec, Me., in 1917.[205] Frequent off Browns Bank.[170]

BIOLOGY AND ECONOMICS: The grenadiers are bottom fish, usually living on mud bottom. This species has been caught at depths of 9–1250 fathoms but they are most common in 50–100 fathoms. Those taken in shallower water have been in areas where surface waters are cold. They are reported to eat euphausiids and amphipods.[49]

Roughnose grenadier — Grenadier-scie

Trachyrhynchus murrayi Günther 1887

DESCRIPTION: Body elongate, greatest depth 7 in total length, occurring at beginning of 1st dorsal, tapering gradually to tip of pointed tail, compressed. Head 3⅓ in total length, snout prolonged and pointed and with rather sharp lateral edges, projecting over and beyond mouth, distance from eye to tip of snout, 2⅔ in head length; a depression on the side of the head behind eye; mouth inferior, under but slightly in front of eye, a small barbel on lower jaw, angle of mouth under pupil of eye, bands of fine teeth in each jaw. Eye large, oval, longitudinal diameter 3¾ in head length. Fins: dorsals (2) 1st 9, first rays longest 5 in head, subsequent ones gradually shorter, base 7 in head, fin originates above posterior edge of gill cover, 2nd many-rayed, gradually decreasing, fin originates a short distance behind 1st dorsal and continues to the tip of the tail; anal many-rayed, similar in height to 2nd dorsal, originates immediately behind vent; pectorals moderate, rounded, longest rays 3¾ in head, base on middle of side, a short distance behind gill opening; pelvics smaller, first ray prolonged and 2½ in head, others much shorter, fins located ventrally, slightly ahead of base of pectorals. Lateral line high on side. Much of body covered with moderate-sized scales, many bearing small spines; a series of larger scales, each armed with a projecting ridge, along each side of the base of the anterior portions of the dorsal and anal fins and extending forward beyond these fins, giving the appearance of rows of teeth; abdomen between pelvic fins and vent scaleless.



Colour, light; dorsal and anal fins, first ray of pelvic fins, and mouth cavity, black.

DISTINCTIONS: The roughnose grenadier resembles the marlin-spike and the roughhead grenadier in its general shape and fin arrangement but differs from them in possessing a small barbel on the lower jaw and a prolonged first ray in the pelvic fins. The first dorsal fin is not as high and it has ridged scales near the dorsal and anal fins.

SIZE: Up to a length of 15 inches.[179]

RANGE: Reported once from off southern Labrador and several were caught in the Faroe Channel at a depth of 555 fathoms.[179]

Canadian distribution: One specimen was caught by the M.V. *Investigator II*, September 16, 1954, off Hamilton Inlet, Labrador, at lat 54°50′N, long 53°29′W, in 390 fathoms.[9]

Order ALLOTRIOGNATHI (Lampridiformes)

OPAHS

This is a small order containing fewer than 15 species of rather large oceanic fishes of quite different shapes. The fins of these fishes are soft-rayed, the dorsal sometimes with one or two spines, the pelvic fins are thoracic (behind the pectoral fins) and with up to 17 rays.

In the family Trachypteridae is a long, laterally compressed fish called the oarfish, *Regalecus glesne,* which has long spatulate pelvics (hence the name oarfish) and a greatly elongate body that may be very thin and only inches deep and 40 feet or more in length. The dorsal fin originates over the head where it is high and bright red. Many reports of sea serpents are thought to have originated from sightings of oarfish on the surface. The oarfish has only recently been reported from Atlantic waters off the Florida coast and is unlikely to occur in our coastal waters, but it might be sighted far offshore in the Gulf Stream.

Only one species of this order occurs in our area.

Family LAMPRIDIDAE — Opahs

Opah — **Opah**

Lampris regius (Bonnaterre) 1788

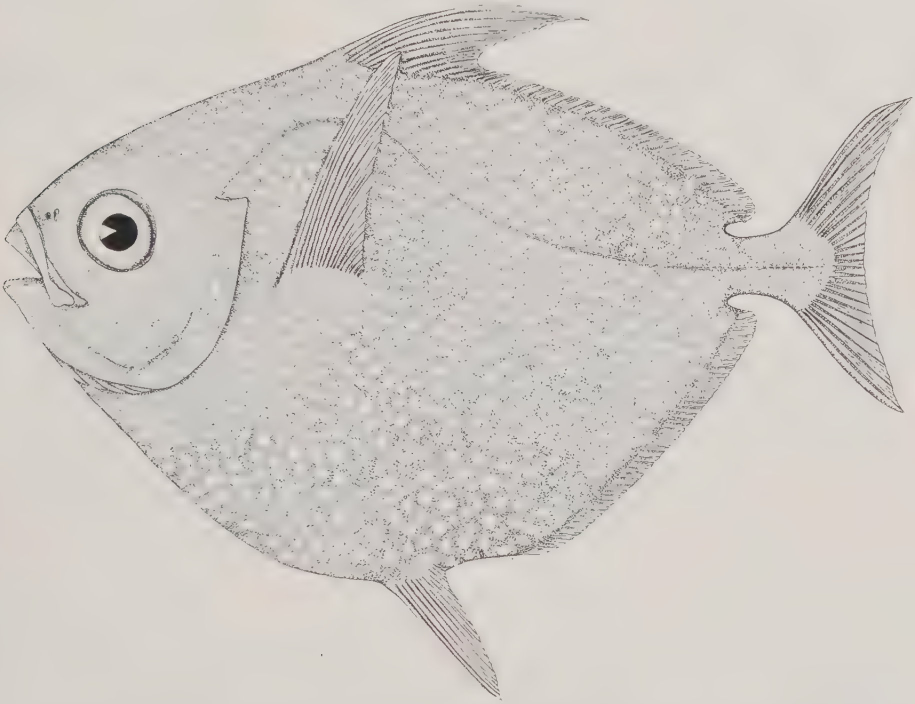
OTHER COMMON NAMES: moonfish, Jerusalem haddock, poisson lune

DESCRIPTION: Body short, much compressed, very deep—2 in total length; caudal peduncle moderately slender. Head 3¼ in total length, compressed; mouth terminal, small, not extending beyond front of eye, toothless. Eye large, 4 in head. Fins: dorsal (1), 53–55, originating at highest part of back and continuing to caudal peduncle, first rays high equalling ⅘ length of head, rapidly decreasing producing a scythe-shaped appearance, depressible in a groove; caudal broad, lunate; anal, 38–41, shorter than dorsal, first rays short, increasing slightly posteriorly and ending at caudal peduncle, depressible in a groove; pectorals long, triangular, base horizontal, behind gill opening, length equal to longest rays of dorsal; pelvics inserted ventrally under first part of dorsal, large, scythe-shaped, slightly longer than pectorals. Lateral line present, arched high in front. A pit at base of caudal fin, above and below. Scales small. Vent midway between base of pelvics and anal.

Colour, dark steel-blue above, shading into green with silver, purple, and lilac lustre; belly rosy; jaws and fins vermillion; entire body sprinkled with silvery spots.

DISTINCTIONS: The opah should be readily recognized by its oval shape, scarlet to vermillion jaws and fins and silvery spots on the body.

SIZE: The opah reaches a length of 6 feet but rarely exceeds 4 feet.



RANGE: Found in open waters of the Atlantic and Pacific oceans. On the western side of the Atlantic from Grand Bank to the West Indies and Gulf of Mexico. Off Iceland, Norway, in the Mediterranean and off Madeira.

Canadian distribution: Recorded once from the Grand Bank.[49] Once at Sable Island in 1856.[232] One, 3 feet long, was caught in July 1925 on Sable Island Bank.[368] There is a record of one caught off LaHave Bank, between lat 42° and 49°N (probably a misprint for 43°) and between long 62° and 63°W.[170] One, 4½ feet long, was caught on Browns Bank in the spring of 1932.[493] A specimen weighing 108.2 pounds and 45.5 inches long was caught on a longline on September 10, 1962, about 110 miles south of Halifax, and reported by McKenzie and Tibbo.[316b]

Order BERYCOMORPHI (Beryciformes)

BERYCOID FISHES

The bony fishes are broadly separable into soft-rayed and spiny-rayed forms but, of course, some forms in the soft-rayed groups have one or two spines, and many of those in the spiny-rayed groups have lost their spines and are soft-rayed. Between the two are fishes of intermediate position whose relationships are not clear. This is the position of the berycomorph fishes. The group resembles the percomorphs in the possession of ctenoid scales, fin spines, premaxillae forming the borders of upper jaw. However, in the berycomorph fishes, the pelvic fin is thoracic or subabdominal and there is one spine and 3–13 soft rays, usually more than five soft rays (percomorphs have five soft rays, sometimes fewer, never more). These are oceanic fishes often occurring in deep seas.

The Berycomorphi are usually classified in two suborders and about 100 species. The number of species occurring in the Canadian region is in doubt but at least six either have been reported or are known to occur. Two of these are treated in detail.

KEY to Order BERYCOMORPHI—Berycoid Fishes

1 A pair of well-developed hyoid barbels present .... Stout beardfish, *Polymixia nobilis* (p. 229)
No hyoid barbels present 2

2 Scales small or minute; gape large, extending well behind eye; anterior teeth in lower jaw enlarged, the length greater than eye diameter .... Ogrefish, *Anoplogaster cornuta**
Scales large; gape moderate; teeth not conspicuously enlarged 3

3 Pelvic fin with one thin, blade-like spine and 5 soft rays; body deep and strongly compressed .... Spinyfin, *Diretmus argenteus* (p. 230)
Pelvic fin of one spine and 7–13 soft rays; body more or less elongate, not noticeably deep 4

4 Pelvic fin with one spine and 7 soft rays; scales cycloid .... Bean's blueback, *Scopelogadus beanii***
Pelvic fin with one spine and 10–13 soft rays; scales ctenoid 5

5 Scales in lateral line 63–73; dorsal soft rays 16–19 .... Alfonsin a Casta Larga, *Beryx decadactylus**
Scales in lateral line 71–78; dorsal soft rays 13–15 .... Alfonsin a Casta, *Beryx splendens**

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* Not treated in detail.

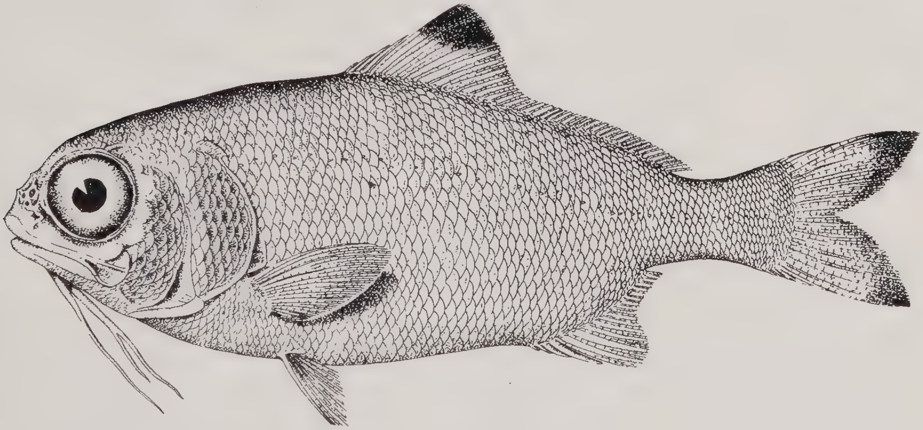
** *Melamphaes beanii* (Günther) 1887, family Melamphaidae, was reported by McAllister[291] based on Goode and Bean.[170]

Family POLYMIXIIDAE Beardfishes

Stout beardfish **Gros barbudo**

Polymixia nobilis Lowe 1838

DESCRIPTION: Body oblong, compressed, greatest depth 3¼ in total length, occurring at origin of dorsal fin, caudal peduncle stout. Head with blunt snout, its length 3½ in total length, upper profile steep and rounded, compressed; 2 barbels on lower jaw, length 1⅖ in head; edge of gill cover serrated; mouth large, low on head, almost horizontal, angle under posterior part of eye, teeth in broad velvet-like bands on jaws, tongue, vomer, and palatines. Eye large, its diameter about 3 in head, located moderately high on head. Fins: dorsal (1) V, 28–38, first spine short, about 5 in eye diameter, spines increasing in length uniformly to 5th, whose length equals eye diameter, first soft rays 1⅓ times eye diameter, subsequent ones decrease rapidly in length until 12th ray is 3 in eye diameter, subsequent rays uniformly this length, base of fin 1⅓ times head length, fin begins just behind middle of pectoral and ends almost on caudal peduncle; caudal moderate, deeply forked, tips pointed; anal III–IV, 16–18, first spine very short, others gradually longer until 4th is 1½ in eye diameter, spines stout, first soft rays equal to eye diameter, then decreasing until 7th ray which is 5 in eye diameter, subsequent rays uniform, length of base of fin a little more than ½ head length, fin begins under middle of dorsal and ends a little in front of end of dorsal; pectorals moderate, roundly pointed, longest rays a little less than 2 in head, inserted low on side, behind gill opening; pelvics roughly triangular, smaller than pectorals, first ray spinous, situated ventrally slightly posterior to bases of pectorals. Lateral line present. Body and sides of head covered with large scales; 48–54 scales along lateral line.



Colour, a soft violet-brown, opalescent on the back and fins; upper margin of the orbit and two bands above the snout golden-green; maxillary roseate, inner margin of lobes of caudal fin whitish.

DISTINCTIONS: The chin barbels, the large scales covering the body and much of the head, with the dorsal and anal fin having both spines and soft rays serve to distinguish this species.

RANGE: Widely distributed in moderately deep water, up to 345 fathoms.

Reported from the Atlantic Ocean at Madeira, Canary Islands, St. Helena, Cuba, and Newfoundland. Also recorded in the Sea of Japan, in the Indian Ocean at Mauritius, and the Andaman Islands.[170]

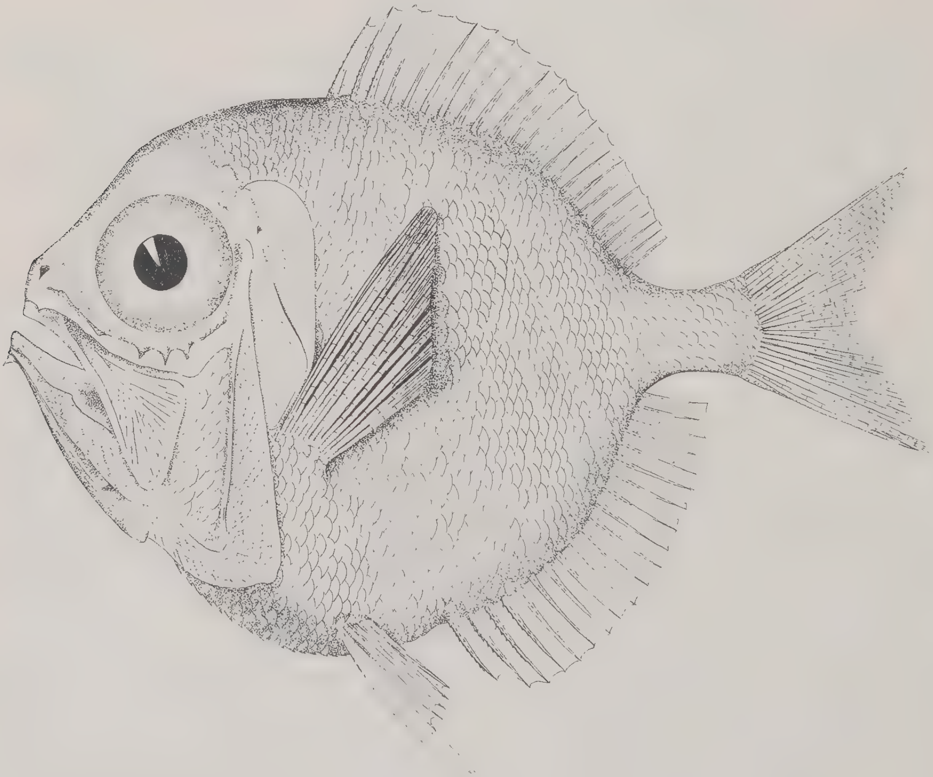
Canadian distribution: One specimen was taken in June 1954 on the southern tip of the Grand Bank at lat 43°07′N, long 50°47′W, in 110 fathoms.[9]

Family DIRETMIDAE Spinyfins

Spinyfin **Rayon épineux**

Diretmus argenteus Johnson 1863

DESCRIPTION: Body rounded, much compressed, greatest depth 1⅘ in total length, occurring at origin of dorsal fin; caudal peduncle small, short and much compressed; abdomen keeled. Head triangular, compressed, about 3½ in total length, upper profile concave in front of eye; mouth large, obliquely ascending, angle under posterior edge of pupil of eye, lower jaw projecting and ending in a forwardly-directed spine, bones of upper jaw much enlarged in rear, narrow bands of fine teeth of unequal size in the jaws, no teeth on vomer or palatines. Eye very large, 1¾ in head, located high on head. Fins: dorsal (1), 26–28, first 3 or 4 rays graduated, 5th ray longest being 1¾ in head, succeeding rays shorter, length of base of fin 1⅕ times head



length, beginning over operculum and ending at base of caudal peduncle; caudal moderate, quite deeply forked; anal 23–24, first 3 rays graduated, 4th ray longest 1⅗ in head, succeeding rays gradually diminishing, base equals length of dorsal, ending at base of caudal peduncle; pectorals large, base horizontal, fin directed upward, front rays longest, almost as long as head, posterior rays gradually shorter, fin located just behind gill opening, base a little lower than eye; pelvics, I, 5, the spine is enlarged, thin and knife-like with the forward edge toothed, 2nd and 3rd soft rays longest, approximately equal to length of pectoral, fins inserted on ventral edge of body, under posterior edge of base of pectoral. Body covered with moderate scales, closely adhering, with a naked space around the eyes and on the nape; scales on part of the gill cover and on the caudal peduncle; scales of 2 types, ctenoid on the back and posterior part of body and cycloid in the area of the pectoral fins, the vent, and the unpaired fins.

Colour, silvery, the back iridescent; fins whitish.

DISTINCTIONS: This fish is distinguished by its almost circular outline and its much compressed body; the blade-like spine of each pelvic fin is a ready distinguishing mark. Superficially the fish resembles the butterfish and the moonfish but is more nearly circular and has a much larger mouth. It has large pelvic fins, whereas the butterfish has none and those of the moonfish are small. The absence of dorsal spines separates it from the filefishes and the triggerfishes. It lacks the bony bucklers and three anal spines of the American John Dory.

SIZE: A Newfoundland specimen measured 4¼ inches long; hitherto the largest specimen was 3½ inches long.[110b]

RANGE: Found in deep water, up to 2700 fathoms, at several places in the North Atlantic Ocean between the Bay of Biscay, the Azores, and the Madeira Islands; and once a short distance north of Flemish Cap.

Canadian distribution: One specimen was taken on July 17, 1956, north of Flemish Cap at lat 48°18′N, long 44°37′W, in 350 fathoms.[11]

Order ZEOMORPHI (Zeiformes)—DORIES

The dories are small, marine forms that resemble both berycomorph and percomorph fishes and are intermediate to these in anatomical detail. The pelvic fins are thoracic in position and consist of one spine and 5–9 soft rays, there is a spinous dorsal fin and 2–4 spines precede the anal fin, and the first vertebra is united to the skull. The group consists of less than 50 species, distributed in tropical and temperate shore waters of moderate depth. Only one species occurs with any regularity in the Canadian area, *Zenopsis ocellata*, family Zeidae.

KEY to Order ZEOMORPHI

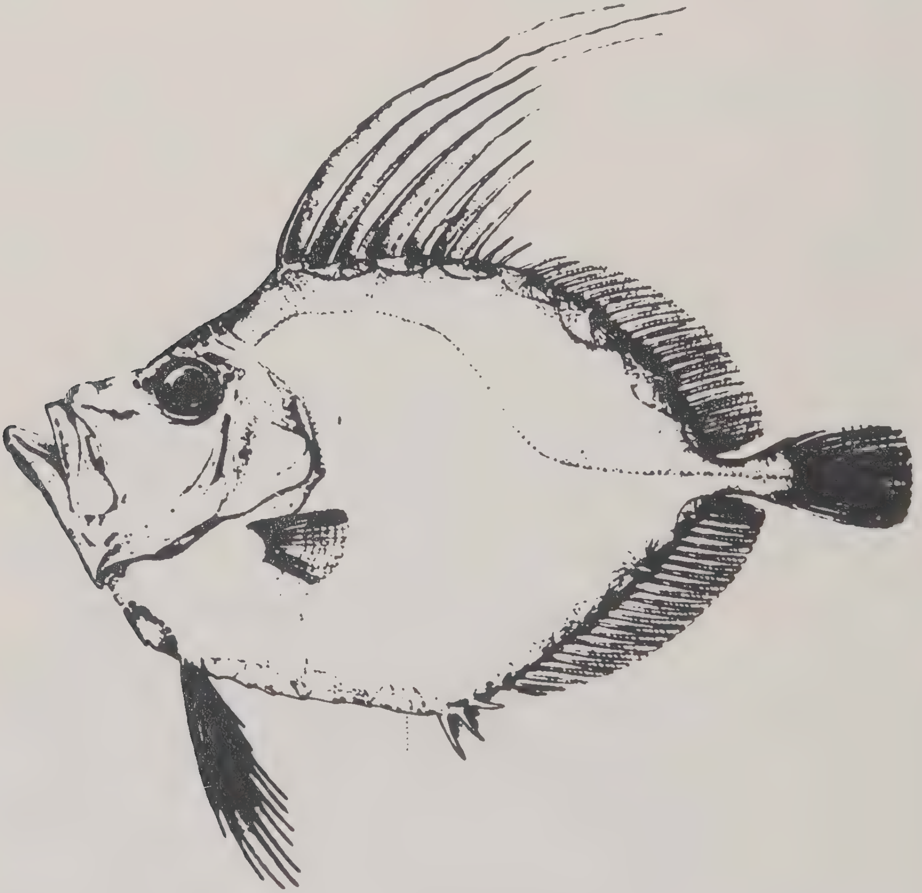
Large, plate-like spines along bases of dorsal and anal fins and along midline of belly; no spines on sides; mouth large; pectoral fin base in advance of posterior margin of gill cover .... American John Dory, *Zenopsis ocellata* (p. 232)
Small, thorn-like spines along bases of dorsal and anal fins and 11 or 12 flattened

spines on sides; mouth small; pectoral fin base behind posterior margin of gill cover .... Grammicolepid, *Xenolepidichthys americanus**

American John Dory Zée bouclé d'Amérique

Zenopsis ocellata (Storer) 1858

Description: Body very deep, much flattened, depth ½ length. Fins: dorsals (2), IX–X, first 3 spines prolonged, their length about equal to body depth, remainder progressively shorter; 2nd dorsal, 25–27, low, extending almost to caudal peduncle; anal, III, 24–26, spines stout, base a little longer than soft dorsal; pectorals small, inserted below and behind eye, tips of rays free; pelvics larger than pectorals, ventral and in front of pectorals; caudal, small, brush-shaped. Head, lower jaw projecting, large mouth set very obliquely, dorsal profile of



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* A member of the family Grammicolepidae, this species has been recorded from Georges Bank but is not treated here in detail.

head concave; eye 5 in head. Scaleless but with bony bucklers, each with one or more hooked thorns, arranged near dorsal and ventral edges; 2–3 along base of spiny dorsal, 4 along base of soft dorsal, 2 in midline in front of pelvic fins, one in midline behind pelvics, 6 pairs along the belly to the anal fin and 5 along base of anal fin.[49]

Colour, silvery. Smaller specimens up to 10 inches long, with 12–24 vaguely defined dark spots on either side. Larger individuals retain only one of these spots on each side.

Distinctions: The long dorsal spines and bony bucklers along bases of dorsal and anal fins and ventral margin of body are sufficient to distinguish the John Dory from fishes of similar shape.

Size: Up to a length of 24 inches and a weight of 7 pounds.

Range: Restricted to the western North Atlantic and caught most frequently near edge of continental shelf from vicinity of Sable Island, off Nova Scotia, to areas off North Carolina. Reported in recent years from almost every trawl haul on outer slope of Georges Bank, sometimes in hundreds.[49] Occasional specimens taken inshore, in Gulf of Maine, from Cape Cod to Mount Desert.[399]

Canadian distribution: Four specimens have been reported in areas adjacent to Canada. (1) A specimen, 6⅓ inches long, taken by trawler *Penguin*, November 19, 1936, at lat 43°50′N, long 61°30′W, 45 miles W by N from Sable Island, in 30 fathoms; (2) a specimen, 19 inches long, 3¼ pounds, taken by trawler *Fordham*, January 2, 1937, at lat 42°45′N, long 64°30′W, between LaHave and Browns banks, in 52–60 fathoms.[137] (3) One specimen from Emerald Bank, off Nova Scotia.[49] (4) A juvenile specimen caught in a weir, at Herring Cove, Campobello Island, New Brunswick, early October 1942, 3½ inches long, the smallest representative of this species that has been caught.

Biology and Economics: The European John Dory (*Zeus faber*) has been esteemed as table fish since Roman times. Its North American counterpart is not abundant enough to have commercial value.

Order PERCOMORPHI (Perciformes)—Spiny-Rayed Fishes

This is the largest order of fishes and is composed of species that differ greatly in size and shape. Some species may mature at a maximum size of ½ inch while others, such as the bluefin tuna, attain lengths of several feet and a weight of 1200 pounds or more. The typical spiny-rayed fishes are found in both salt and fresh waters but most are marine and some even occur in the deep seas; however, the greatest number of species and individuals occurs in the inshore seas of temperate and tropical regions.

Percomorph fishes are characterized primarily by the presence of fin spines, the dorsal and anal fins are usually preceded by one or more spines, the pelvic fin is thoracic or jugular in position and is composed of one spine and five or fewer soft rays; and the pelvic girdle is usually attached to the cleithrum; the upper jaw is bordered by the tooth bearing premaxillary; the air bladder is without a duct; the scales are usually ctenoid and the caudal fin has 17 principal rays, 15 of these being branched.

The order is classified in about 15 suborders, over 1000 genera, and at least 6000 species. Canadian species represent six suborders and about 80 species, or about 27% of the total number of species occurring in the area.

Suborder PERCOIDEA—Perch-like fishes

This is the largest of the suborders, embracing about 80 families. These are the most generalized of the percomorphs having thoracic or jugular pelvic fins of one spine and five soft rays and without the special features that distinguish the remaining suborders.

Family SERRANIDAE — Basses

This is a large family of predaceous fishes, mainly but not entirely marine, living in coastal waters in tropical and temperate seas. Many species are important food fishes. The family is composed of more or less unspecialized percomorph fishes that are usually laterally compressed; mouth rarely oblique and with pointed teeth usually arranged in bands, preopercle usually serrate, dorsal fin spinous anteriorly and soft-rayed posteriorly, dorsal and anal fins without scaly sheath nor scale covered, anal fin with three spines, joined by membrane, not free, pelvic fin with one spine and five soft rays, thoracic and without a pelvic axillary process. The family contains over 400 species but only four have been reported to occur in the Canadian Atlantic area.

KEY to Family SERRANIDAE

1 Dorsal fins (first spiny, 2nd soft-rayed) appearing as 2 distinct fins, entirely separate or very weakly joined 2

Dorsal fins (spiny and soft-rayed portions) broadly joined 3

2 Anal fin rays usually 9; anal fin spines not graduated in size, stout, the longest spine ¾ or more the height of anal fin; body without stripes .... White perch, *Roccus americanus* (p. 237)

Anal fin rays usually 11; anal fin spines graduated in size and slender, the longest spine less than ½ the height of anal fin; body with about 7 lateral stripes .... Striped bass, *Roccus saxatilis* (p. 239)

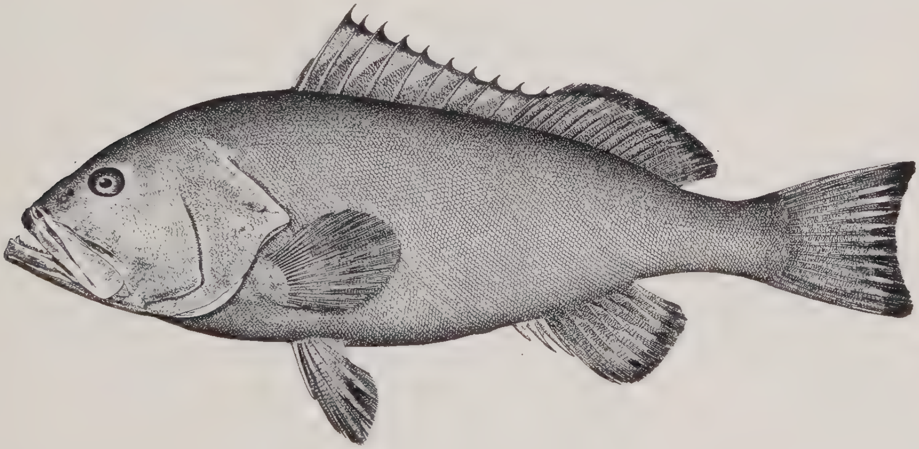
3 Pelvic fins inserted slightly behind pectoral fins; head smooth and without rough crests; first or spiny dorsal fin high anteriorly; posterior spines not greatly shortened; caudal fin emarginate ... Red grouper, *Epinephelus morio* (p. 235)

Pelvic fins inserted under or slightly in advance of pectoral fins; head with rough crests; first or spiny dorsal fin with longest spines in centre, graduating in size before and after; caudal fin rounded .... Atlantic wreckfish, *Polyprion americanus* (p. 236)

Red grouper **Mérou nègre**

Epinephelus morio (Valenciennes) 1828

Description: Body stout, greatest depth at beginning of dorsal fin 3½ in total length, compressed; caudal peduncle rather stout. Head 3¼ in total length, pointed, upper profile rounded; preopercle serrate; mouth terminal, somewhat oblique, angle of mouth under posterior edge of eye, lower jaw projecting slightly, teeth moderate in narrow bands on jaws with 2 short canines in front of each jaw. Eye 7–8 in head. Fins: dorsal (1) XI, 16–17, spinous and soft portions continuous, first spine short, second spine longest about 3 in head, spines then decreasing in length, soft portion uniformly as high as longest spine, fin originates above base of pectoral and ends just before caudal peduncle; caudal fin large, lunate; anal III, 8–9 (usually 9), spines progressively longer but all shorter than soft rays which are 3 in head, fin originates under beginning of soft dorsal and ends before tip of soft dorsal, base length 2 in head; pectorals medium, rounded, base behind gill opening and low on sides, fin length 2½ in head; pelvics slightly smaller than pectorals and located under them on ventral edge of body. Lateral line present. Scales small, extending on to soft portions of vertical fins.



Colour, olive-gray or olive-brown, with red or salmon-colour shades on lower sides of head, on jaws, and on isthmus; sides somewhat blotched with paler olive; dark orange spots on head; vertical fins same colour as body with broad ridges of blue-black and white edging; pectorals light olive, pelvics dusky. Older specimens acquire more reddish tints.

Distinctions: The red grouper may be distinguished from the other fishes in this area with continuous spiny and soft-rayed dorsal fins by its larger mouth, which reaches beneath the eye; the redfish, cunner, tautog, scup, and sheepshead have small mouths that do not reach the eye. The red grouper has a lunate caudal fin; the cunner and tautog have rounded caudal fins.

SIZE: Up to a length of 3 feet.

RANGE: Atlantic coast of North and South America from Virginia to Rio de Janeiro, Brazil; straying to Massachusetts, when young, and once to Nova Scotia.

Canadian distribution: There is only one record; two small specimens, 1¼ inches long, were seined in Eastern Passage, Halifax Harbour, Nova Scotia, October 12, 1928.[498]

Atlantic wreckfish — Cernier atlantique

Polyprion americanus (Bloch and Schneider) 1801

OTHER COMMON NAMES: shern, cernier

DESCRIPTION: Body robust, rather deep, greatest depth 3 in total length, compressed, ventral edge straight between pelvic fins and anal, caudal peduncle heavy. Head pointed, less than 3 in total length; mouth large, angle under middle of eye, lower jaw projecting markedly, slender teeth in bands on jaws, vomer, palatines, and tongue; various spines on edges of gill covers; a bony protuberance over eye. Eye 6 in head. Fins: dorsal (1) XI, 11–12, spines very stout, the 4th the longest, about 3 in head, 11th spine longer than 10th, fin originates over gill opening, base of spinous part slightly less than head length, soft rays a little higher than spinous fin to which it is attached, their base about one-half length of that of spinous portion, soft part of fin overhangs caudal peduncle; caudal heavy, rounded; anal III, 8–9, spines very heavy, serrated, increasing in length consecutively, the 3rd 3½ in head, soft part higher and rounded, entire fin located under soft part of dorsal; pectorals rounded, 2½ in head, located on sides behind gill opening; pelvics ventral, larger than pectorals, length 1½ in head, located slightly in front of base of pectorals. Lateral line well marked. Small, rough scales cover body and base of soft median fins.

Colour, grayish or blackish-brown; caudal fin edged with white. Young specimens mottled.

DISTINCTIONS: The wreckfish can be distinguished from the striped bass and white perch by its single dorsal fin (the others have two). It differs from the redfish in having a rounded tail, that of the redfish being concave. The bony protuberance over the eye and its generally rough appearance are characteristic.

SIZE: Up to 5 feet in length and a weight of 100 pounds.

RANGE: The wreckfish is widely distributed, but is not abundant on the western side of the Atlantic Ocean. It occurs from the Grand Bank to LaPlata River in Uruguay. There are occasional records from the Gulf of Maine and the Cape Cod region. It is more abundant in Europe, from Norway to the Mediterranean. Off the Canary Islands; at the Cape of Good Hope and in the south Indian Ocean.

Canadian distribution: It has been recorded twice from the Grand Bank. The first record simply states that one was caught on the Grand Bank by a Gloucesterman.[170] The second specimen, 6 inches long, was caught on the Grand Bank by the Canadian Schooner *Jean and Shirley* in

August 1929. The location was lat 44°50′N, long 50°20′W; the specimen was under floating wreckage.[411]

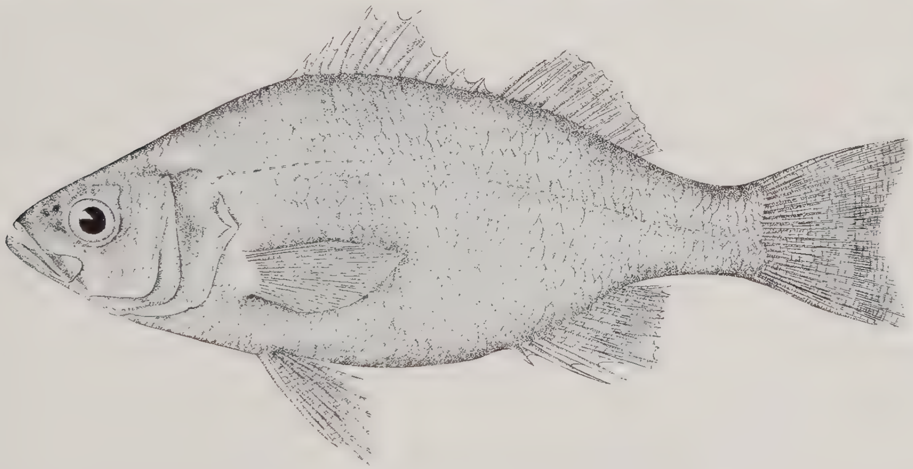
Biology and Economics: While reported from 300 fathoms in Europe the wreckfish is often found under wreckage near the surface. It appears on European markets as a food fish.

White perch **Perche blanche**

Roccus americanus (Gmelin) 1789

Other common names: sea perch

Description: Body rather short and deep, greatest depth 3⅓ in total length, compressed, caudal peduncle heavy. Head pointed, 3¾ in total length, edges of gill covers slightly serrated; mouth terminal, short, its angle in front of eye, small unequal teeth in jaws and on sides of tongue only, lower jaw projecting very slightly. Eye about 5 in head. Fins: dorsals (2), 1st IX, very stout spines connected by membrane, increasing in length to third which is 2½ in head, then decreasing, origin over middle of pectoral, base ⅘ length of head, 2nd dorsal I, 12, a deep notch but no free space dividing it from 1st dorsal, same height as 1st dorsal but shorter; caudal heavy, concave; anal, III, 8–10, the spines very heavy, the third longest, about 3 in head, longest soft rays 2 in head, base of fin a trifle shorter than that of soft dorsal, extending a little behind soft dorsal; pectorals rounded, low on side behind gill opening, length about ⅔ of head; pelvics a trifle shorter than pectorals, preceded by one strong spine, located ventrally and slightly behind base of pectorals. Lateral line distinct. Scales large, covering body, sides of head, and space between eyes and nostrils.



Colour of upper surface variously olive, dark grayish-green or dark silvery-gray, shading to paler olive or silvery-green on sides and to silvery-white on belly. Large specimens with bluish lustre on head and on lower jaw. Fins more or less dusky. Pelvic and anal fins sometimes rose-coloured.[482]

Distinctions: In general the white perch resembles the striped bass but it is deeper and more compressed. There is no free space between the two dorsal fins in the white perch, whereas there is a short interspace in the striped bass. The white perch has about 48 rows of scales between the gill cover and the base of the caudal fin, the striped bass has about 60 rows. The anal spines are not graduated, 2nd and 3rd spines almost of equal length in the white perch, whereas those of the striped bass are graduated.

Size: Up to a length of 19 inches and a weight of 4¾ pounds. Usually not over 10 inches and 1 pound.[482]

Range: Atlantic coast of North America from the upper St. Lawrence River and southern Gulf of St. Lawrence to South Carolina, usually in brackish waters. Frequent in freshwater ponds and lakes near the sea, especially in the northern part of the range. Established in Lake Ontario and some contiguous New York State waters.

Canadian distribution: Specimens were reported in the St. Lawrence River near Montreal and near Quebec City;[507] not uncommon in the Miramichi estuary; abundant in Lake of Shining Waters and other ponds along the north side of Prince Edward Island.[410] Reported from Dingwall, Aspy Bay, Nova Scotia;[95] from Lake Ainslie, Cape Breton, from the following additional fresh waters in Nova Scotia: Big Dam Lake (Annapolis County), Pollock Lake (Queen's County), lakes near Grand Etang and Warren Lake (Cape Breton), Minanheak Lake (Lunenburg County), Grand Lake and Cow Bay Pond (Halifax County);[268] they have also been reported as abundant in Jesse, Tedford and Trefry lakes in Yarmouth County;[436, 438] mouth of LaHave River, Nova Scotia, in brackish water.[268] In the Bay of Fundy area, apart from a record near Eastport, Maine,[242] it is restricted to fresh water; reported from Wheaton Lake, Charlotte County, New Brunswick[205] and from Potter's Lake in the same county;[439] and from waters connected to the Saint John River;[93, 348] it also occurs in the St. Croix River system and has been reported from Richibucto, Kent County.[425]

Biology and Economics: The white perch is anadromous but in many Canadian waters it behaves like a landlocked form. Its marine distribution is never far from the mouths of rivers, except in the south where it has been reported in 20 fathoms in Chesapeake Bay. It was observed, in the LaHave River, Nova Scotia, to be moving upstream through a trap at tide-head from early May to the end of June, with the greatest movement in May. After July 1 such movements were very infrequent. The fish tolerates very high temperatures, up to 80 F in shallow lakes.

Spawning occurs in Maine from late May to late July and the time is doubtless similar in Canada. An average female produces 40,000 eggs. The eggs are spherical, 0.7 mm in diameter, with a large oil globule. They are adhesive and stick to the bottom materials in the fresh or slightly brackish waters where they are deposited. Hatching occurs in about 30 hours at 68 F and in 4½ days at 58 F.[482]

White perch may grow rapidly. In Lake Jesse, Nova Scotia, they reach a length of over 6½ inches in 5 years.[437] The normal life span is 6–7 years but specimens up to 17 years old have been found.[482]

As fry, the white perch eat plankton. As adults they take aquatic insects and fishes. The former include mayfly, caddis fly, dragon fly, and midge larvae; the latter include smelt, yellow perch, elvers, and their own species.[482] In salt water they eat any small fishes, shrimp, crabs, and any available fish spawn.[49]

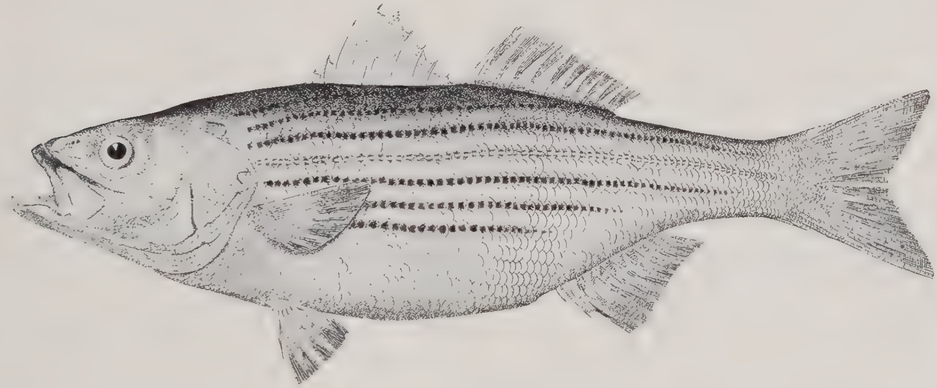
No use is made of white perch in Canada, although it is moderately abundant. One lake in Nova Scotia, of 52 acres, contained over 23,000 white perch.[435] Commercial catches of almost 2 million pounds annually have been made in Chesapeake Bay, where anglers find it a good sport fish.[49]

Striped bass — Bar d'Amérique

Roccus saxatilis (Walbaum) 1792

Other common names: striper, rock, rockfish

Description: Body somewhat elongate but stout, greatest depth about 4 in total length, under middle of spinous dorsal, slightly compressed, caudal peduncle stout. Head 4 in total length, bluntly pointed, slightly compressed, mouth terminal, lower jaw projecting slightly, angle of mouth in front of eye, teeth small, 2 parallel patches on base of tongue, also present on jaws, vomer, and palatines; 2 backwardly-directed, weak spines on margin of each gill cover, preopercle weakly serrate along edge. Eye 8 in head. Fins: dorsals (2) 1st VIII–X, stout spines connected by membrane, fourth spine longest 2½ in head, first and last spines very short, others intermediate, fin located over tip of pectoral, 2nd dorsal 10–13, first rays equal longest spine, decreasing posteriorly to less than half longest ray, located a short distance behind spinous dorsal, its base equal to that of spinous dorsal and ⅔ of head length; caudal heavy, slightly forked; anal III, 7–13, first spine short, second spine longer, third spine longest and 6 in head, soft rays similar in length to 2nd dorsal, base of fin ¾ length of base of 2nd dorsal, terminating slightly behind 2nd dorsal; pectorals moderate, located below midline behind gill opening, length 2 in head; pelvics triangular, ventral, base slightly behind base of pectoral, equal to pectorals in size. Lateral line present. Scales large, ctenoid.

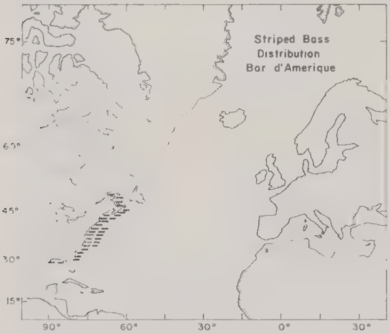


Colour, dark olive-green, varying to bluish or black above, paling on sides to silver and white on belly, sometimes with brassy reflections. Sides with 7 or 8 more or less prominent horizontal, dark stripes, following scale contours and more or less interrupted; those above lateral line longer than those below, the last stripe usually ending before anal fin; none of the bands extend onto the head.

DISTINCTIONS: It closely resembles the white perch but can be distinguished by the more slender spines of the dorsal and anal fins. The black stripes on the sides of the striped bass are lacking on the white perch; nor is it likely to be confused with the rare wreckfish that has a very rough appearance and smaller scales.

SIZE: The striped bass can reach a very large size. One over 6 feet long and weighing 125 pounds was recorded in North Carolina.[49] One weighing 75 pounds was caught in the Saint John River.

RANGE: The striped bass, coastal in its habitat, is seldom found more than a few miles from the shore except during spring and fall migrations. It is distributed along the North American Atlantic coast from the St. Lawrence River and southern Gulf of St. Lawrence to northern Florida (St. Johns River), the centre of abundance appearing to be from Cape Cod to northern North Carolina, including Chesapeake Bay.[372] In the Gulf of Mexico region, it is found in fresh and brackish tributaries in western Florida, Alabama, Mississippi, and Louisiana.



Introduced on the Pacific coast in 1879 and 1882, it has spread over a range from southern California to southern Oregon.[335]

Canadian distribution: The striped bass is not found north of the Laurentian Channel. It is reported from the St. Lawrence River from above Trois Pistoles, Quebec, to Montreal.[268, 504] In the Gulf of St. Lawrence it is reported from the Miramichi River and estuary,[312] Tignish, Prince Edward Island,[92] Malpeque Bay, P.E.I.,[334] and at Cheticamp, Nova Scotia.[95] In recent years many specimens have been caught at the mouth of River Philip, N.S., Summerside, P.E.I. and Richibucto, N.B. On the outer coast of Nova Scotia it is reported from Canso, N.S.[91]; also reported from Mira Bay, Chedabucto Bay, and Mahone Bay, N.S.[49] In the Bay of Fundy it is found in the Minas Basin area, along the shores of St. John and Yarmouth counties, and in the St. Croix, Digdeguash, Saint John, Kennebecasis, Shubenacadie, and Annapolis rivers.[205] Some are caught in Shubenacadie Lake, N.S.[103, 104, 105]

BIOLOGY AND ECONOMICS: The anadromous movements of striped bass are well known and will be described below. Fish tagged in the St. Lawrence River have shown upstream movement and some have been recaptured in the same general area a year later.[504] In the United States tagging has shown that some striped bass move northward and eastward from Chesapeake Bay and areas in New Jersey to the New England States in late winter and early spring, while others move into the upper waters of Chesapeake Bay. In some years a few may reach Canadian waters but no definite records are known. In the autumn a reverse movement takes place by which the fish reach Chesapeake Bay by December.[321, 372] Such lengthy migrations may be the exception rather than the rule. There is no evidence that fish under 2 years old migrate very far.[49]

In Canada striped bass are often seen as the ice breaks up in Shubenacadie

Lake, Nova Scotia, and specimens can be obtained in the Saint John River system in mid-winter.

Large striped bass migrate up rivers, such as the Saint John, Shubenacadie, Annapolis, Miramichi, and St. Lawrence in early June and deposit their eggs near the head of tide. Because of actions associated with spawning they are often called "rollers." In the Shubenacadie River the eggs have been found in slightly brackish water, to which they may have drifted.

In the United States spawning is earlier; late April and early May in North Carolina and May in Chesapeake Bay.[49] Striped bass spawn more than once, but not necessarily every year.[372]

As the eggs were hatched artificially at one time, the production per female is well known; it varies from 11,000 to several million eggs, a 4½-pound fish yielding 265,000. The eggs are large, about ⅛ inch in diameter, there is a large perivitelline space and a large oil globule. The eggs sink in quiet water but are easily swept along by water currents since they are almost buoyant. They hatch in 3 days at 58–60 F and in 2 days at 67 F.[49]

In August and September large numbers of striped bass fry have been observed in the Shubenacadie River. They were then from 1 to 1½ inches long. At the same time fish from 2½ to 4 inches long were very abundant in Minas Basin. Those in the river would be a few weeks old, the group in Minas Basin 1 year old. Two-year-olds were from 6½ to 9 inches long. Later growth has not been determined for Canadian material and only estimates are available elsewhere. Striped bass weighing 35–50 pounds are believed to be about 8–10 years old. Females reach maturity at 4–5 years of age and males somewhat earlier.[321]

The striped bass is a voracious feeder. In the sea it eats a wide variety of small fishes such as alewives, herring, smelt, eels, flounders, mummichogs, rock eels, sand lance, silver hake, and silversides, and feeds on invertebrates including squid, crabs, sea worms (*Nereis*), and amphipods. Immature specimens in Minas Basin feed largely on the sand shrimp (*Crago septemspinosus*). In Shubenacadie Lake, where the striped bass live in fresh water, they eat insect larvae, young alewives, elvers, and yellow perch.[405]

Striped bass, when small, are eaten by other predacious fishes such as silver hake and cod, but as mature fish they have few enemies. They are attacked by external and internal parasites but there is no evidence that their well-being is greatly affected.[321] (See also Raney[372, 375].)

Striped bass are not caught in sufficient quantity in Canada to have much importance as food fish. They are caught in weirs, traps, and gill nets, and by anglers. The catch of striped bass from the Canadian Atlantic area for the year 1962 was 62,000 pounds, with a value of $7000.[70b]

In 1945 over 115,000 pounds were landed between Maine and Cape Cod and larger quantities are taken around Chesapeake Bay; anglers take a large share.[49] In California, landings have approached 2 million pounds annually.[372]

In Canada, as in the United States, the numbers have fluctuated widely. Angling in the sea has not been exploited to any extent in Canada. About 1000 striped bass were angled in Shubenacadie Lake in 1949.[104]

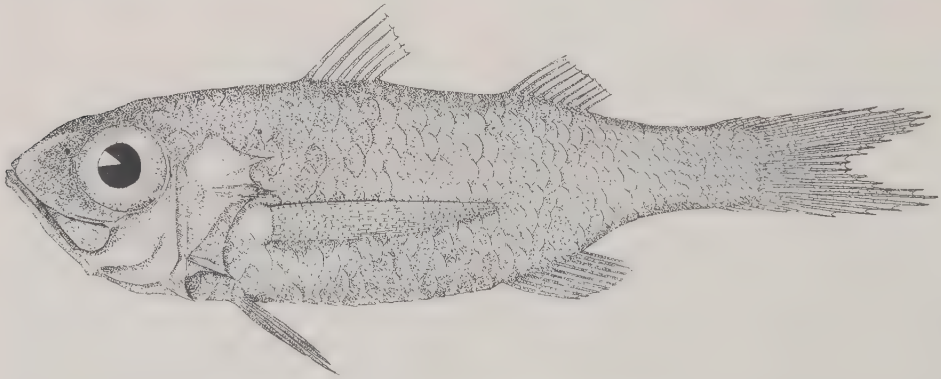
Family APOGONIDAE Cardinalfishes

These are small fishes occurring mainly in warm seas, some dwelling in deep water.

Sherborn's cardinalfish **Apogon de Sherborn**

Rhectogramma sherborni Norman 1930*

DESCRIPTION: Body moderately elongate to ovate, greatest depth 4 in total length, occurring at beginning of 1st dorsal, somewhat compressed; caudal peduncle stout. Head 3⅓ in total length, pointed, profile rounded, 2 spines at upper and 2 spines at lower angles of gill cover, the lower ones stronger, lower jaw projecting slightly; mouth terminal, oblique, angle under anterior edge of pupil, one row of minute teeth in jaws. Eye large, 3 in head, high on head. Fins: dorsals (2), 1st VIII, first spine very short, others much longer, fourth longest and 2½ in head, base 3 in head, fin begins slightly behind a perpendicular through posterior tip of gill cover, 2nd dorsal I, 9, rounded, middle rays 2 in head, base 2½ in head, space between dorsal fins 3 in head; caudal moderately large, forked; anal III, 7, first spine very short, second 4 in head, third 2½ in head, first soft rays slightly longer, base of fin 2½ in head, fin originates under middle of 2nd dorsal; pectorals rather long, slightly shorter than head, base half way between lateral line and ventral edge and a short distance behind gill opening; pelvics I, 5, slightly over 2 in head, located ventrally under base of pectorals. Lateral line evident, with a break between the two dorsal fins. Body covered with large scales and 2 rows on cheeks.



Colour, dark brown or black, with silvery reflections.[141]

DISTINCTIONS: This species may be distinguished from others in this area, that possess 2 dorsal fins, one of which is spiny, by the near equality in size of the

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* Parr[343] refers this species to the genus *Galeagra* (i.e. *G. sherborni*) in the family Chilodipteridae.

2 fins, combined with the position of the pelvic fins under the base of the pectorals, the very large eye and the spines on the gill cover.

SIZE: Up to a length of 4.1 inches.[10]

RANGE: The species has been recorded in the Western North Atlantic Ocean on the Grand Bank and southward. In the South Atlantic off South and West Africa.[141, 434] A related species occurs in the South Pacific Ocean.

Canadian distribution: Two specimens were caught by the trawler *Zebroid*, in late November 1954; on the southeastern Grand Bank in the neighbourhood of lat 45°45′N, long 48°20′W, and between lat 42°50′N, long 51°10′W, and lat 46°00′N, long 49°04′W. The depths were from 130 to 180 fathoms.[10]

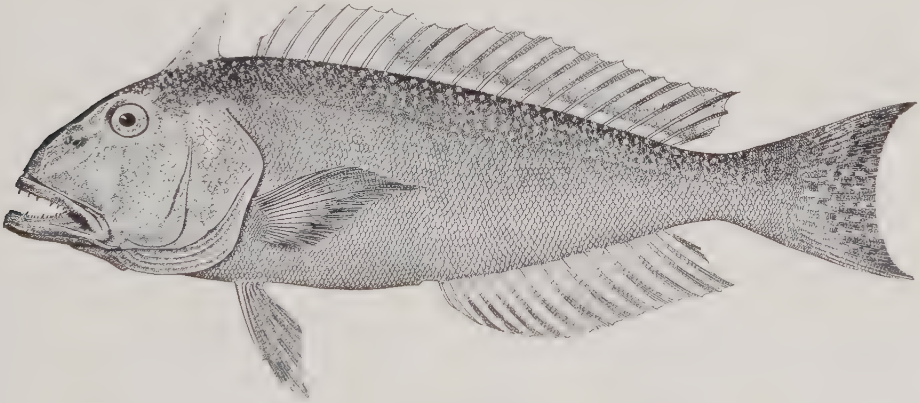
Family BRANCHIOSTEGIDAE Tilefishes

These are fishes of temperate and tropical seas; some may reach a large size. In general they are of little economic importance.

Tilefish **Tile**

Lopholatilus chamaeleonticeps Goode and Bean 1879

DESCRIPTION: Body stout, greatest depth 4 in total length at level of gill opening from which point the body tapers to caudal peduncle, somewhat compressed; caudal peduncle moderate; a triangular, thin, fleshy flap projects from the upper midline of the head in the nape region, its height 1½ times eye diameter. Head large, strongly convex in dorsal profile, nearly straight in ventral profile, 3½ in total length; mouth moderately large, lower jaw projecting, angle of mouth under front of eye, a small barbel-like projection on each side of lower jaw near the angle, pointing backward, canine teeth in both jaws, followed by bands of smaller teeth. Eye 6½ in head. Fins: dorsal (1), VII, 15, first spine short, remainder of rays uniformly 3 in head, fin originates above gill opening and extends to caudal peduncle, being nearly twice length of head; caudal moderate, lunate, lobes pointed; anal, II, 13, spines weak, a little higher than dorsal, extending from under middle of dorsal fin to under end of dorsal; pectorals



moderately large, pointed, $\frac{2}{3}$ of head length, located immediately behind gill opening and rather low on sides; pelvics smaller than pectorals, on ventral edge, base slightly in front of that of pectorals. Lateral line present. Moderately large scales on body and on head.

Colour, brilliant; bluish to olive-green on back and upper part of sides, changing to yellow or rose on lower sides and belly, latter with white midline. Head reddish on sides, white below. Back and sides above lateral line thickly dotted with irregular yellow spots. Dorsal fin dusky with larger yellowish spots, its soft-rayed portion pale edged; adipose flap greenish-yellow; anal fin pinkish with purple to blue iridescence; pectorals pale sooty-brown with purplish reflections.[49]

DISTINCTIONS: The adipose flap on the nape and the barbel-like projections on the lower jaw readily separate the tilefish from all others.

SIZE: Tilefish reach a length of 42 inches and a weight of 35 pounds.

RANGE: Along the outer part of the continental shelf and the upper part of the continental edge from Banquereau to off Chesapeake Bay; also off southern Florida and in the Gulf of Mexico. Not reported in less than 45 fathoms.

Canadian distribution: The most northerly record is from lat 44°26′N, long 57°13′W (Banquereau) where a small specimen was caught in December 1902; another small one was reported nearby in 1933.[49, 432] There have been two more recent captures. A 30-inch specimen was caught between LaHave and Emerald banks in 78 fathoms on June 2, 1953; a 35-inch specimen, weighing almost 28 pounds when gutted, was caught just outside Roseway Bank at lat 43°21′N, long 64°40′W, in 85 fathoms on May 1, 1954. These specimens were identified and drawings submitted by Technicians Murray Fraser and L. H. Roberts.

BIOLOGY AND ECONOMICS: The tilefish is a bottom fish, restricted to depths between 45 and 170 fathoms. It frequents water of a temperature of 47–53 F. It eats crabs, shrimp, squid, molluscs, marine worms, sea cucumbers, and other invertebrates and occasionally small fishes; sometimes pelagic amphipods are found in the stomachs. They spawn in July; the eggs are about .05 inch in diameter, have an oil globule and are believed to be buoyant.

A spectacular fact about this fish concerns a very heavy mortality that occurred in the winter of 1882. Dead tilefish, by the millions, were reported floating off Delaware Bay. It is thought that they were killed by an extensive flooding of their haunts by cold water. The mortality was so extensive that fishing for them was unproductive until about 1895.

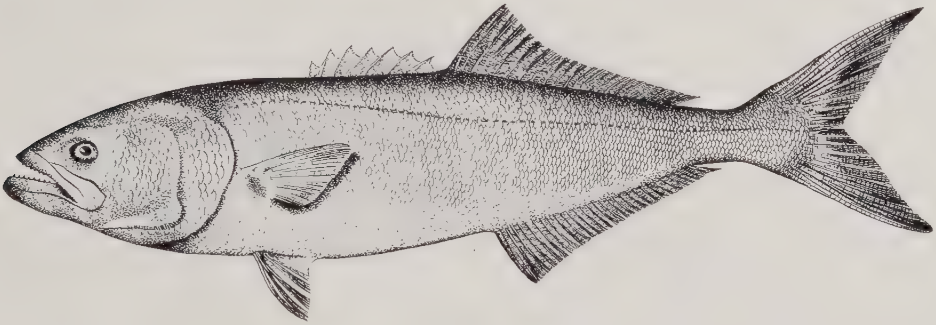
In 1916–17 over 11 million pounds of tilefish were caught off the United States coast. Market conditions have caused this amount to dwindle to small proportions. It is reported to be a delicious food fish.[49]

Family POMATOMIDAE Bluefishes

This is a small family indeed, containing only one genus and one species, but it is closely related to the Carangidae, the jacks or pompanos.

Pomatomus saltatrix (Linnaeus) 1758

Description: Body oblong, stout, greatest depth 5 in total length, somewhat compressed; caudal peduncle moderate. Head 4 in total length, rather blunt, somewhat compressed, lower jaw projecting and heavy; mouth otherwise terminal, oblique, angle under middle of eye, upper and lower jaws with a single row of stout, conical teeth. Eye 11 in head. Fins: dorsals (2), 1st VII–VIII, short, but stout spines connected by membrane, longest spine 6 in head, beginning over middle of pectoral fin, base length 1¾ in head, depressible in a groove, 2nd 23–26, beginning almost immediately behind spinous dorsal, first rays longest, 2¾ in head, gradually diminishing to end of fin near caudal peduncle, base slightly longer than head; caudal forked, large; anal, II, 25–27, small, detached spines, usually hidden in skin, fin of same shape and height as 2nd dorsal, but a little shorter, ends a trifle behind 2nd dorsal; pectorals moderate, approaching triangular shape, located midway between lateral line and ventral edge of body, slightly behind gill opening, length 2 in head; pelvics ventral, under base of pectorals, slightly smaller than pectorals. Lateral line very slightly elevated above pectoral fin. Scales moderate, covering head, body, and bases of soft median fins.



Colour, sea-green above, silvery below; median and pectoral fins similarly tinted; a black blotch at the base of pectorals.

Distinctions: The bluefish is distinguished from the mackerels by the absence of finlets, from the striped bass by its low spinous dorsal fin, and from the carangids (pilotfish, rudderfish, mackerel scad, etc.) by the stout, conical, canine teeth which, in a single series, line the upper and lower jaws.

Size: Up to a length of 3¾ feet and a weight of 50 pounds. The usual size is from 10 to 15 pounds.

Range: In warmer seas. Off the east coast of the Americas from Cape Cod to Brazil and Argentina, occasionally straying northward to Nova Scotia and the coast of Maine. At Bermuda; off northwestern Africa; in the Mediterranean; on both coasts of southern Africa; Madagascar; eastern Indian Ocean and the Malay Peninsula; southern Australia and New Zealand.[49]

Canadian distribution: The bluefish occurs as a rather frequent stray in the coastal waters of Nova Scotia. Specimens taken there are usually under 15 inches in length. There was an early record by Jones[232] from the coast of Nova Scotia. A specimen was caught at Liverpool, N.S. in 1928;[264] the M.V. *J. J. Cowie* caught one at Ketch Harbour, N.S., in September 1950; one was caught in Minas Basin, N.S., in July 1951; they were numerous enough to be angled for at Vogler's Cove, N.S., in 1951. A few specimens were seen off Yarmouth, N.S. from 1931 to 1934.[513]

Biology and Economics: The bluefish is a pelagic species travelling in schools which are often extensive. During the summer they remain in water where the temperature is 58 F or higher. The immature sizes sometimes swim close to shore and these appear to be the only ones that stray far north. Since some bluefish have been caught on the edge of the continental shelf in midwinter, it is probable that the winter migration is partly an offshore one, but tagging has shown some migration from off New York to Cuba.

Spawning occurs from June to August. It is probable that the eggs are buoyant.

Bluefish are voracious and play havoc with schools of mackerel, herring, menhaden, and alewives. Various other small fishes, shrimp, and squid are eaten as well.

This species is not important in Canada. It is an excellent food fish and in some years upwards of 2½ million pounds are caught on the Atlantic and Gulf coasts of the United States. The annual catch varies greatly in the northern part of its range. Bluefish are also valued by anglers as a sport fish.[49]

Family CARANGIDAE Jacks and pompanos

A wide-ranging family of oceanic fishes, the jacks are most numerous in tropical and subtropical seas. The general form and shape of the body differs widely, some species being very deep-bodied and strongly laterally compressed while others may be very mackerel-like, with more fusiform bodies. The general characteristics of the carangids are: body more or less compressed, usually with cycloid scales but often naked, the scales on the lateral line sometimes enlarged and spiny; the spiny dorsal fin usually short; anal fin usually preceded by two separate spines often forming a separate fin but sometimes embedded; caudal fin widely forked, caudal peduncle slender.

Although widely distributed in the oceans of the world, the eight species of carangids that reach our area are essentially summer and autumn visitors.

KEY to Family CARANGIDAE

1 Body strongly compressed laterally and noticeably deep; head greatly elevated, giving effect of a “long face” 7

Body moderately compressed laterally and not markedly deep; head not strongly elevated 2

2 Lateral line with raised specialized scales or scutes, forming a distinct ridge, often more prominent posteriorly 3

Lateral line without raised specialized scales or scutes 6

3 Maxillary extending to posterior margin of eye or beyond; a black patch on gill cover; pectoral fin falcate .... Crevalle jack, *Caranx hippos* (p. 248)

Maxillary not extending to posterior margin of eye, but terminating in front of or below pupil of eye 4

4 Lateral line strongly arched behind head, arch terminating over, not beyond, pectoral fin; anus located below centre of spinous dorsal fin .... Blue runner, *Caranx crysos* (p. 247)

Lateral line scarcely arched, gently curved; anus below last ray of spinous dorsal fin, or posterior to it 5

5 Body elongate; distance between pelvic fin tips and anus about equal to body depth .... Mackerel scad, *Decapterus macarellus* (p. 249)

Body moderately compressed and deep, rather than elongate; pelvic fin tips barely reach anterior edge of anus .... Bigeye scad, *Selar crumenophthalmus* (p. 255)

6 Dorsal fin spines short, without connecting membrane in adult; mouth small; maxillary not quite reaching line through anterior margin of eye .... Pilotfish, *Naucrates ductor* (p. 250)

Dorsal fin spines moderately developed and connected by membrane; maxillary extending to below pupil of eye ...... Banded rudderfish, *Seriola zonata* (p. 253)

7 Anterior rays of soft dorsal and anal fins greatly elongated, succeeding rays very short .... Atlantic lookdown, *Selene vomer* (p. 251)

Anterior rays of soft dorsal and anal fins not elongated; all rays relatively short .... Atlantic moonfish, *Vomer setapinnis* (p. 253)

## Blue runner		Carangue jaune

Caranx crysos (Mitchill) 1815

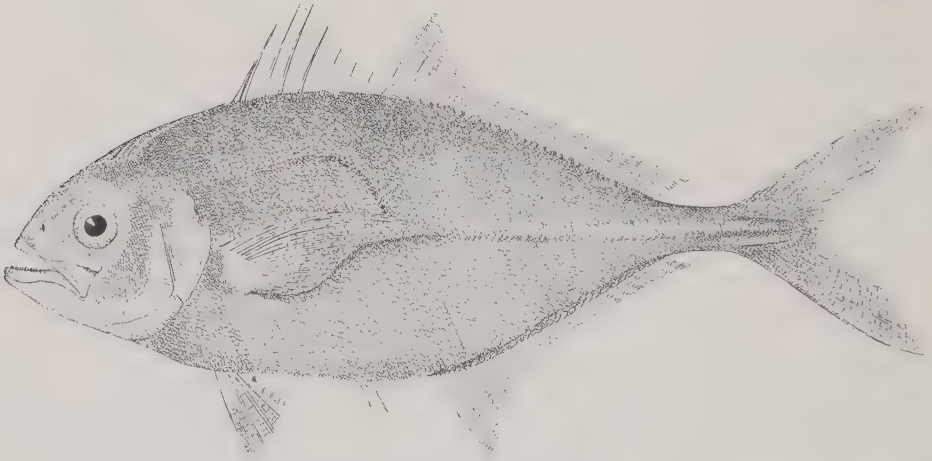
OTHER COMMON NAMES: hardtail, yellow jack

DESCRIPTION: Body oblong, compressed, rather deep, greatest depth 3⅓ in total length, at level of origin of 2nd dorsal; caudal peduncle small, bearing keeled scales. Head 4⅓ in total length, compressed, snout blunt, profile rounded making a uniform curve with body; mouth fairly large, its angle in front of eye, lower jaw projecting, a single series of comparatively large teeth in lower jaw, smaller ones in upper jaw, teeth on tongue and vomer. Eye 5 in head, normally situated. Fins: dorsals (2), 1st VIII, triangular, second spine longest 4 in head, base of fin 1½ in head, originating above first third of pectoral, 2nd dorsal I, 23–25, the spine 6 in head, longest soft ray a little less than 2 in head, eighth and succeeding soft rays about 10 in head, very short gap between dorsal fins, the soft one ending on caudal peduncle; caudal large, deeply forked; anal, 19–21, preceded by a finlet of 2 short, stout spines a considerable distance before the soft fin, shape similar to soft dorsal, i.e. with a high anterior lobe, only a trifle shorter than soft dorsal; pectorals long, equalling head length, scythe-shaped and pointed, base just behind gill opening; pelvics ventral to base of pectorals, length 2½ in head, roughly triangular. Scales small, except on lateral line, covering body entirely as well as sides of head.

Lateral line arched above pectoral fin, posteriorly armed with keeled scales that are largest near caudal peduncle.

Colour, greenish-bronze above, golden or silvery on lower sides and belly; a dark spot on upper gill cover edge but not on pectoral fin; some duskiness on fins.

DISTINCTIONS: The absence of finlets distinguishes the blue runner from the mackerels and mackerel scad; the arched lateral line distinguishes it from the bigeye scad; the large spinous dorsal separates it from the Atlantic moonfish and bluefish; and the absence of canine teeth and the presence of scales on the breast separate it from the crevalle jack.



SIZE: Reaches a length of 22 inches and a weight of 4 pounds. Those taken in Canadian waters are less than a foot long.[49]

RANGE: Atlantic coast of the Americas from Cape Cod to Brazil, but straying north to Halifax, N.S. A closely related species occurs in the Pacific Ocean.

Canadian distribution: Although there are few actual records it is believed that the blue runner occurs sparingly along the Nova Scotian coast in the late summer months.[232, 513] Definite records are from off Liverpool, N.S., in 1928;[204] from Pubnico, N.S., September 1, 1930, and from Herring Cove, Halifax Harbour, September 30, 1934. The largest of these specimens was 12 inches long.[498]

Crevalle jack — Carangue crevallé

Caranx hippos (Linnaeus) 1766

OTHER COMMON NAMES: crevalle, jack

DESCRIPTION: Body oblong, compressed, anterior profile very strongly arched, greatest depth 3½ in total length (under spinous dorsal); caudal peduncle small, bearing keeled scales. Head 4 in total length, very blunt, compressed; mouth large, lower jaw prominent and projecting slightly, angle of mouth under middle of eye, a broad band of small teeth, the outer row conical, in upper jaw, teeth in one row in lower jaw with 2 distinct canines at front of jaw. Eye 5 in head, situated high on head. Fins: dorsals (2), 1st VII–VIII, triangular, second spine longest, 2⅔ in head length, base of fin 1⅔ in head length, located over middle of pectoral fin, 2nd dorsal, 20, first rays 1½ in length of head, diminishing to ¼ of this by seventh ray, the remainder uniform in length, fin extends from a very short distance behind spinous fin to base of caudal peduncle; caudal large, deeply forked; anal 18, preceded by 2 short, strong spines connected by membrane with each other but independent of soft anal, soft anal same shape and height as soft dorsal, originating under fourth ray of dorsal and ending on base of caudal peduncle; pectorals low on sides, base a short distance behind gill opening, slightly longer than head, scythe shaped, directed upward and backward; pelvics located ventrally under base of pectorals, 2½ in head length, almost triangular. Scales small, except on caudal peduncle, covering body except for an area on "breast" in front of pelvic fins and extending up towards gill opening; in this naked area there is a small triangular scaled spot immediately in front of pelvics. Lateral line with its posterior portion armed with strong bony plates, these larger on caudal peduncle, each armed with a spine; anterior half of lateral line somewhat arched.

Colour, greenish or olive above; sides and belly silvery with golden blotches; a distinct black blotch on gill cover; edge of soft dorsal black.

Distinctions: The crevalle jack can be distinguished from the mackerels and mackerel scad by the absence of finlets; it differs from the bluefish, pilotfish, rudderfish, moonfish, and lookdown in having a much larger spinous dorsal fin; from the bigeye scad by the steep profile of its head; from many other spiny-rayed fishes by its small caudal peduncle, deeply forked tail and scythe-shaped pectorals; and from its closest relative, the blue runner, by its canine teeth and naked "breast."

Size: It reaches a length of 2½ feet and a weight of about 20 pounds.[66]

Range: Abundant in warm seas on both coasts of the Americas; from Woods Hole, Mass., to West Indies and Venezuela; straying north as far as Nova Scotia. Found in the Gulf of California and in the Indian Ocean.

Canadian distribution: Only one record; 3 specimens, between 1¾ and 2 inches long, were caught at Musquodoboit Harbour, Halifax County, N.S., in the summer of 1933.[498]

Mackerel scad Faux-maquereau

Decapterus macarellus (Cuvier) 1833*

Description: Body elongate, little compressed, greatest depth 5½ in total length, profile regular; caudal peduncle moderately small. Head 4⅓ in total length, pointed; mouth terminal, lower jaw projecting slightly, angle of mouth not much more than halfway between snout and anterior edge of eye, teeth feeble. Eye large, 4½ in head. Fins: dorsals (2), 1st VIII, first rays longest, 2 in head, decreasing to very short rays, fin triangular, base a little longer than height, originating over middle of pectoral fin, 2nd dorsal I, 33–34, second ray longest, 3 in head, ninth ray less than half as long and the remainder of fin equals it in height, fin begins less than eye diameter behind spinous fin and ends on caudal peduncle, where it is followed by one finlet; caudal medium, lunate rather than forked; anal, I, 27, preceded by 2 short, stout spines situated a short distance before fin, similar in size and shape to soft dorsal but beginning under

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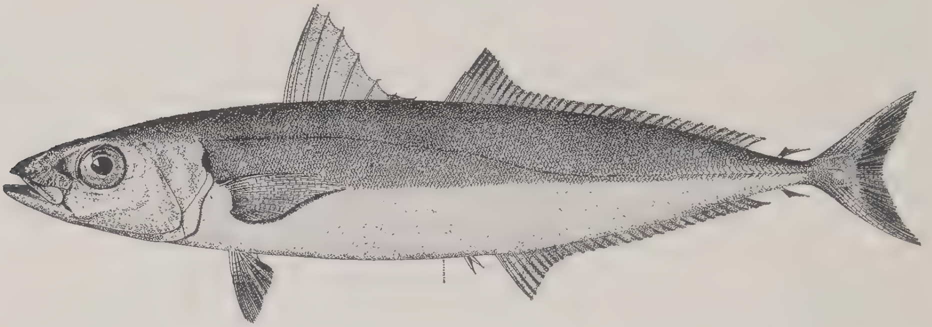
* Bigelow and Schroeder[49] have confused the Canadian records of this fish with those of *Seriola*. We have no record of the mackerel scad from Port Mouton, N.S.

8th soft dorsal ray and ending under tip of soft dorsal, followed by one finlet; pectorals, located low on sides a short distance behind gill opening, pointed, length ⅔ that of head; pelvics located ventrally under bases of pectorals, smaller than pectorals. Scales small; about 30 keeled shields along lateral line beginning under middle of soft dorsal and largest on caudal peduncle. Lateral line somewhat undulating.



Colour, slate-blue or lead-coloured above; belly silvery; small black spot on upper edge of gill cover; axil of pectoral black.

DISTINCTIONS: The mackerel scad is more slender than the other members of its family. It differs from all the other pompanos and jacks in having single finlets behind the dorsal and anal fins. Its second dorsal and anal are much longer than the corresponding fins of the mackerel; the single finlets distinguish it from all members of the mackerel family.

SIZE: Up to a length of 12 inches.

RANGE: Warm parts of the Atlantic Ocean, straying north to the Gulf of Maine and Chedabucto Bay, Nova Scotia.

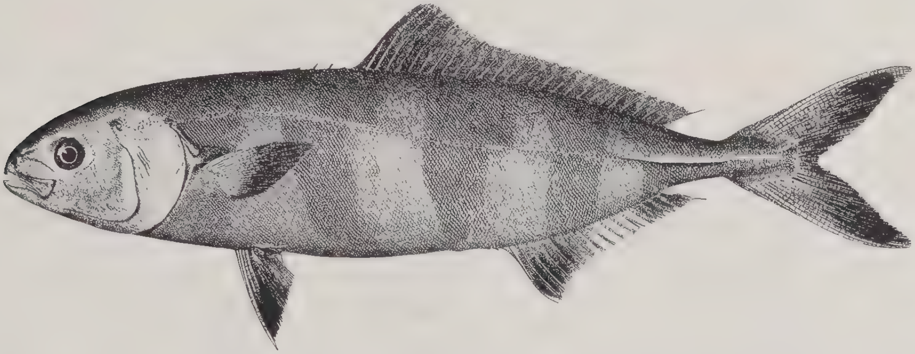
Canadian distribution: Two specimens were recorded from traps in Chedabucto Bay, N.S., in 1901–02.[91] One specimen was seined by the senior author on the shores of Lawlor's Island, Halifax Harbour, N.S., October 3, 1928. It was 2¾ inches long.[306]

Pilotfish — Fanfre

Naucrates ductor (Linnaeus) 1758

OTHER COMMON NAMES: rudderfish, shark pilot

DESCRIPTION: Body elongate, approaching a fusiform shape, little compressed, greatest depth 4¾ in total length; caudal peduncle moderate with a conspicuous, fleshy, lateral keel on either side. Head 5 in total length, snout blunt, profile rounded; mouth terminal, angle of mouth considerably in front of eye. Eye 6 in head. Fins: dorsals (2) 1st III–IV, very short spines, connected by a membrane in young specimens but not in adults, first spine above tip of pectoral, length of spines less than ½ eye diameter, 2nd dorsal 26–27, length of first rays ½ that of head, then decreasing to a uniform height of less than half that of first rays, fin begins about middle of body and ends near caudal peduncle; caudal large, deeply forked; anal II, 16–17, spines very short, height of soft fin similar to dorsal but only ½ as long, ends under posterior tip of 2nd dorsal; pectorals on mid-side, base just behind gill opening, fin length ⅔ that of head; pelvics inserted ventrally slightly behind base of pectorals, about as large as pectorals. Scales small. Lateral line present.



Colour, bluish with 5–7 dark cross-bands, some of which extend over dorsal and anal fins; outer margins of caudal, pectoral and pelvic fins almost black.

DISTINCTIONS: The pilotfish is distinguished from the mackerels by the absence of dorsal and anal finlets. Its deeply forked tail and the keel on caudal peduncle separate it from the barrelfish. The very short spines of the first dorsal distinguish it from the bluefish, rudderfish, mackerel scad, and other carangids.

SIZE: Up to a length of about 2 feet.

RANGE: Cosmopolitan; an oceanic tropical fish that strays to Georges Bank, Sable Island Bank, and the region of Halifax, N.S.

Canadian distribution: Recorded several times near Halifax, N.S., Honeyman[197] reported a 10–11-inch one and in 1949 another was reported; at Sambro Bank and Sable Island Bank three specimens about 16 inches long.[498] All were captured between late July and October.

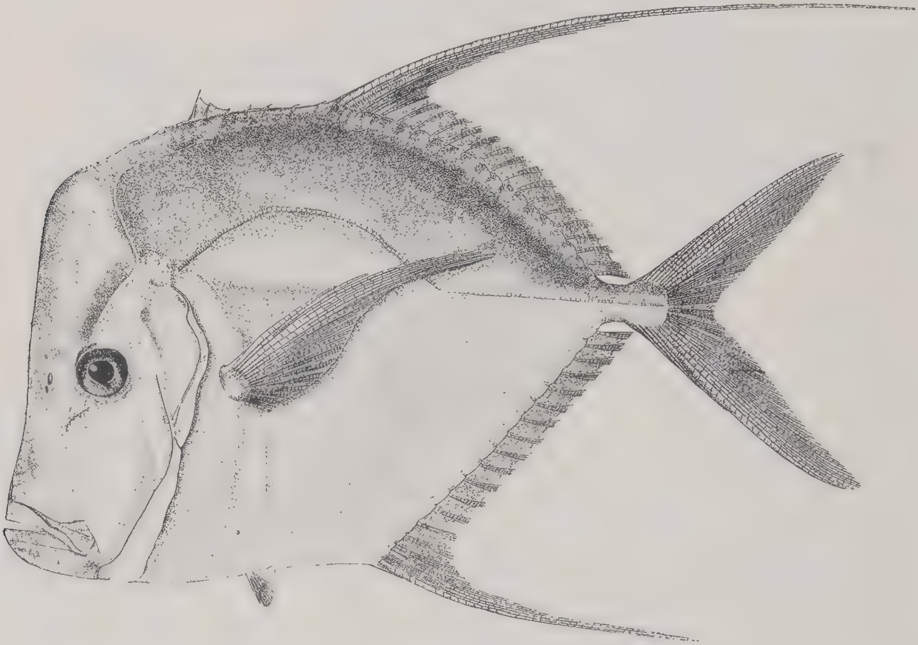
BIOLOGY AND ECONOMICS: This fish often follows ships, apparently to pick up food scraps that are dropped and in tropical waters is commonly a close associate of sharks.

Atlantic lookdown **Sélène atlantique**

Selene vomer (Linnaeus) 1758

OTHER COMMON NAMES: horsehead, moonfish

DESCRIPTION: Body roughly rhomboid, greatest depth 2 in total length, very much compressed; caudal peduncle small. Head short and high, 4 in total length, profile very steep, very slightly concave; mouth low, terminal, slightly oblique, angle well in front of eye, lower jaw projecting, minute teeth on jaws, tongue, and vomer. Eye large, 5 in head, situated about middle of side of head. Fins: dorsals (2), 1st VII–VIII, short inconspicuous spines, first 3 connected by membrane, located above middle of pectoral, 2nd I, 22–23, first rays very long, scythe-shaped, over ½ total length of body, rapidly shortening to 1/17 of length of longest ray and continuing uniformly to base of caudal peduncle; caudal large, deeply forked, its spread over ⅓ total body length; anal, II (disappearing in adult), I, 18–20, similar in shape to 2nd dorsal but scythe-shaped initial portion shorter, base of fin longer than 2nd dorsal, ending on caudal peduncle; pectorals long, 3 in total body length, scythe-shaped, inserted a little below eye level, behind gill opening; pelvics very small, ventral, inserted before pectorals. First half of lateral line strongly arched, posterior half straight. Scales minute.



Colour, uniformly silvery, with leaden shades on back; small specimens with several golden to dark cross-bands.

DISTINCTIONS: The rhomboid shape and greatly compressed body distinguish the Atlantic moonfish and Atlantic lookdown from all other fishes. The great prolongation of the first rays of the second dorsal and anal fins immediately distinguish the lookdown from the moonfish which lacks any such long fin rays. The position of the eye and mouth give it an unmistakably determined look.

SIZE: The Atlantic lookdown reaches a length of about 1 foot; northward-straying specimens are much smaller.

RANGE: Occurs in warm waters of the Atlantic and Pacific coasts of the Americas; from Nova Scotia (?) to Brazil and from lower California to Peru; rare north of Cape Cod.

Canadian distribution: Young specimens of the Atlantic lookdown were reported from coastal waters of Nova Scotia.[197, 232] As these authors do not list the more common moonfish (*Vomer setapinnis*) there is reasonable doubt of the validity of their identification, particularly as Honeyman[197] indicated vague discrepancies between the specimen in hand and the description.

Atlantic moonfish **Assiette atlantique**

Vomer setapinnis (Mitchill) 1815

OTHER COMMON NAMES: horse-fish, bluntnose

DESCRIPTION: Body oblong, very deep, greatest depth 2¼ in total length, very much compressed; caudal peduncle slender. Head short, 3¾ in total length, much compressed, profile very steep, especially above eye, where it is almost vertical; mouth small, terminal, lower jaw projecting, angle of mouth well in front of eye, weak teeth in jaws. Eye somewhat high on head, diameter 5 in head length. Fins: dorsals (2), 1st VIII, very short, detached, located above middle of pectoral fin, second dorsal I, 21–23, low, third soft ray longest, just slightly more than diameter of eye, succeeding rays shorter and uniform, fin begins above posterior third of pectoral and ends on caudal peduncle; caudal large, deeply forked; anal II–IV (short detached spines, not visible in adults), I, 17–19, about same height as dorsal but slightly longer, ending under tip of 2nd dorsal; pectorals, large, slightly longer than head, scythe-shaped, located about middle of side a short distance behind gill opening; pelvics, very small, almost inconspicuous, located on ventral edge, slightly in front of insertion of pectorals. Scales minute, rudimentary. Lateral line strongly arched, its posterior portion with very weak shields.

Colour, bluish-green above, light-silvery on sides, sometimes golden; yellowish to greenish tinges on caudal, pectoral, and base of dorsal fins.

DISTINCTIONS: The Atlantic moonfish can be distinguished by its oblong shape, extremely thin body, and steep head profile. It is separated from its close relative, the lookdown, by the absence of any extreme prolongation of the second dorsal and anal fins.

SIZE: Up to 12 inches in length, usually smaller.

RANGE: In warm seas off the coast of the Americas, from Nova Scotia to Uruguay; rare north of Cape Cod; occurs at Bermuda.

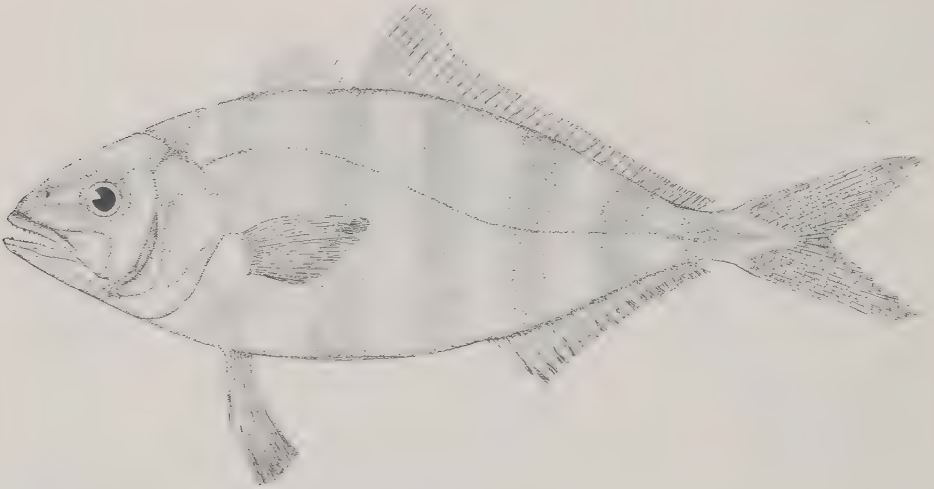
Canadian distribution: The Atlantic moonfish has been reported on three occasions from the inshore waters of Nova Scotia. One specimen was caught near Liverpool, N.S., in the autumn of 1928;[284] two were caught in Port Mouton Bay, N.S., September 21, 1929, and three at Eastern Passage (Halifax Harbour) N.S., at about the same time.[498] All were under 2½ inches in length.

Banded rudderfish **Sériole à ceintures**

Seriola zonata (Mitchill) 1815

OTHER COMMON NAMES: amber-jack, shark pilot, rudderfish

DESCRIPTION: Body oblong, moderately compressed, greatest depth 3½ in total length, profile regularly rounded; caudal peduncle moderate, bearing lateral keels. Head approaching a conical shape, 4 in total length, compressed, profile regular, mouth terminal, lower jaw projecting slightly, angle of mouth under front of eye, broad bands of teeth on jaws, tongue and vomer. Fins: dorsals (2), 1st VII, rounded, longest spines 5½ in head, located above pectoral, 2nd dorsal 36–38, first rays longest being 2 in head, ray length decreasing to end of fin, begins immediately behind spinous dorsal and ends on caudal peduncle; caudal large, deeply forked; anal, in young fish there are 2 spines preceding the soft fin, in adults these are lost, soft portion 20–21, begins a little behind middle of soft dorsal and ends under its tip, longest rays 3 in head; pectoral base located on side below lateral line, closely behind gill opening, rounded, length 2 in head; pelvics ventral to base of pectorals, square-ended, a little longer than pectorals. Scales small, covering body and part of head. Lateral line almost straight.



Colour, bluish above, belly white; sides with about six broad black bars; oblique dark bar behind eye; bars and blotches less distinct in older fish; first dorsal and pelvic fins almost black; free edge of anal and tips of caudal fins white.

DISTINCTIONS: The banded rudderfish is distinguished from the other pompanos and jacks by its moderately developed spinous dorsal fin, which is more pronounced than in the pilotfish and moonfish but lower than in the mackerel scad and hardtails. It has no dorsal and anal finlets like the mackerel scad, and has a much longer soft dorsal than the bluefish. The dark bands on the sides are characteristic of the smaller specimens likely to be seen in the north.

SIZE: Reaches a maximum length of about 3 feet and a weight of 100 pounds.[192]

RANGE: Atlantic coast of North America from the Gut of Canso, Nova Scotia, to the Gulf of Mexico; only as a stray north of Cape Cod.

Canadian distribution: Although this species is said to be well known to Canadian fishermen,[513] few definite records are at hand. A specimen, 8 inches long, was caught in Port Mouton Bay, near Liverpool, N.S., in late summer of 1928.[204] Bigelow and Schroeder[49] erroneously ascribe this specimen to Halifax Harbour. Another specimen, 7½ inches long, was caught in October 1955 in the Gut of Canso between Cape Breton and the Nova Scotia mainland. Both these specimens are preserved in the Museum, Biological Station, St. Andrews, N.B. More recently a 7½-inch specimen was caught in a herring net in the vicinity of Mill River, Prince

Edward Island (Royal Ontario Museum cat. no. 22278). Underwater observations on the behaviour of this species were published by Bleakney.[58]

BIOLOGY AND ECONOMICS: Specimens taken in the Gulf of Maine agree with those reported above in being about the same length or less.[49] They are found around buoys and floating wreckage.

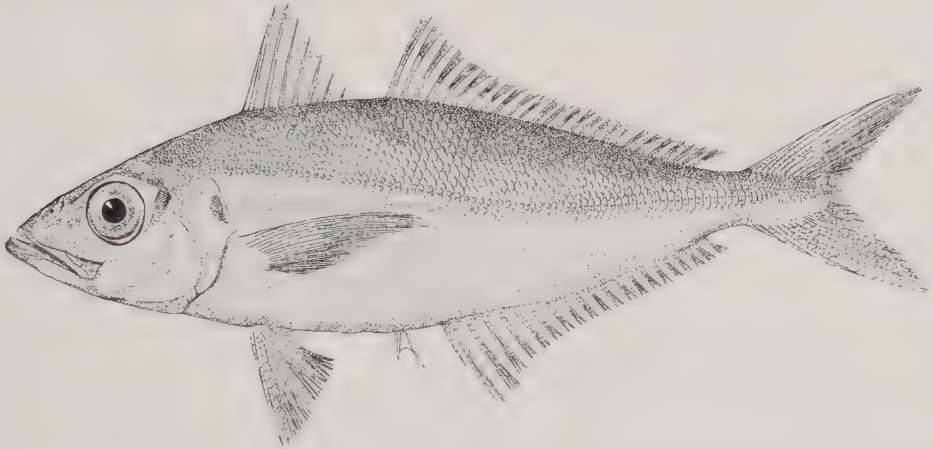
Bigeye scad

Sélar à grandes paupières

Selar crumenophthalmus (Bloch) 1793

OTHER COMMON NAMES: goggle eye jack, goggler, goggle-eyed scad

DESCRIPTION: Body oblong to elongate, little compressed, greatest depth 4⅕ in total length; caudal peduncle moderately stout. Head 3 in total length, snout rather pointed, lower jaw projecting, angle of jaw under front edge of pupil of eye; a single series of very small teeth in each jaw, weak teeth on vomer, palatines, and tongue. Eye large, 3½ in head. Fins: dorsals (2), 1st VII–VIII, triangular, first rays longest, 2⅓ in head, base equal to longest ray, located slightly behind gill opening, 2nd dorsal I, 23–26, first rays highest, 3 in head, rapidly diminishing to ½ this length, beginning a short distance behind first dorsal and ending on caudal peduncle, its base 1⅓ times head length; caudal large, deeply forked; anal, II, isolated short spines in advance of anal fin, I, 20–23, similar in shape to 2nd dorsal, slightly shorter, origin a short distance behind spinous fin, ending directly under posterior tip of 2nd dorsal; pectorals long, rather slender, scythe-shaped, a little shorter than head, located halfway between lateral line and ventral edge and a short distance behind the gill opening; pelvics on ventral edge immediately below insertion of pectorals, almost triangular, length 2 in head. Lateral line almost straight, its posterior ⅓ with special plate-like scales; elsewhere body and part of head covered by small scales.



Colour, bluish above, silvery below; fins, snout and tip of lower jaw with dusky markings; a dark spot on upper edge of gill cover.

DISTINCTIONS: The bigeye scad can be distinguished from the mackerel scad by the absence of finlets, from the hardtails by the straight lateral line; its high first dorsal fin distinguishes it from the pilotfish, rudderfish, bluefish, moonfish, and lookdown.

SIZE: Up to a length of about 2 feet.

RANGE: Cosmopolitan in warm seas, commonest around the West Indies and Pacific coast of Mexico; north to Nova Scotia.

Canadian distribution: The bigeye scad has been reported twice in eastern Canada. Two specimens were taken in trap nets near Canso, Nova Scotia, in 1901.[91] These specimens, ca. 141 mm and 148 mm (5½ and 5¾ inches) are in the collections of the Royal Ontario Museum, cat. no. 22185. A 5½-inch specimen was caught at Centre East Pubnico, Nova Scotia, in September 1951. This fish is preserved in the Biological Station Museum, St. Andrews, N.B.

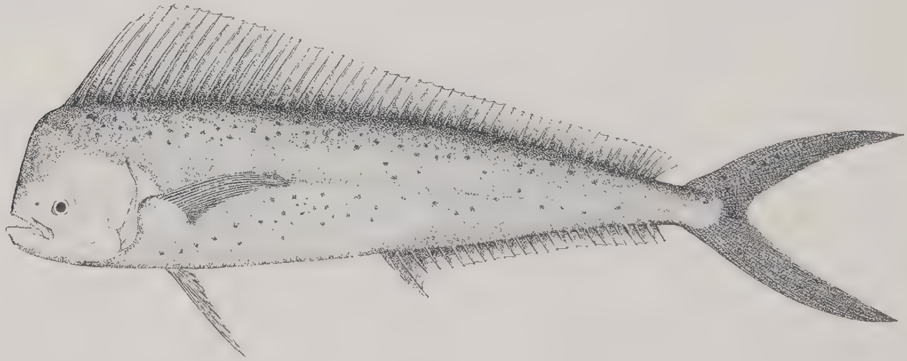
Family CORYPHAENIDAE Dolphins

These are oceanic fishes with elongate, laterally compressed bodies and widely forked caudal fins. They are well known for their brilliant colouration. The biology and distribution of the dolphins in the western North Atlantic has recently been reviewed by Gibbs and Collette.[157]

Dolphin **Dauphin**

Coryphaena hippurus Linnaeus 1758

DESCRIPTION: Body elongate, compressed, greatest depth 5½ in total length at level of gill opening, tapering to a moderate caudal peduncle. Head massive, 5½ in total length, upper profile rounded and steep, especially in males; mouth terminal, low on head, lower jaw projecting slightly, angle of mouth under middle of eye, comb-like teeth on each jaw and on vomer, smaller teeth on tongue. Eye 6 in head, placed low. Fins: dorsal (1) 55–65, originates over middle of head, gradually increasing in height until 2 in head over pectoral, then slightly lower and uniform to caudal peduncle; caudal deeply forked, lobes long, its base separated from dorsal and anal by a short gap; anal 26–30, originates about middle of body and ends under posterior end of dorsal, lower than dorsal; pectorals sickle-shaped, 1½ in head, located just below middle of side and behind gill opening; pelvics located ventrally under base of pectorals, a little larger than pectorals, depressible in an abdominal groove. Scales small. Lateral line present.



Colour, brilliant flashes crossing the body when first taken from the water; sides, when alive, vivid blue variously mottled and washed with golden; tail golden-yellow; belly white to golden.

DISTINCTIONS: The dolphin is distinguished by the following characteristics: a massive head; a strongly compressed and tapering body; a dorsal fin extending along the whole dorsal aspect and a deeply forked caudal.

SIZE: Up to a length of about 6 feet.

RANGE: Cosmopolitan in warm seas. On the east coast of North America straying northward to off Nova Scotia and the southern Gulf of St. Lawrence.

Canadian distribution: Three specimens, about 14 inches long, were caught off North Rustico, P.E.I., in the summer of 1945. One specimen, 3 feet 7 inches long and weighing 23 pounds, was caught 60 miles SW from Sable Island, N.S.,* in August 1930 and is preserved in the Boston Society of Natural History Museum.[271, 415] Another, 2 feet in length, was caught in Bedford Basin, Nova Scotia, in August 1901 and is exhibited in the Provincial Museum at Halifax, N.S.[513] Tibbo[486] reported the capture by hand lines of 8 dolphin from a position near the eastern end of Georges Bank (lat 41°01'N, long 65°54.5'W).

Family BRAMIDAE Pomfrets

This is a small family of rather large oceanic fishes, some dwelling at great depths. They are rather remarkable fishes because of the many morphological changes that take place with growth, thus making very difficult the identification of the young.

KEY to Family BRAMIDAE

Scales large, 40–50 in mid lateral row .... Bigscale pomfret, *Taractes longipinnis* (p. 258)

Scales small, about 80 in mid lateral row .... Smallscale pomfret, *Brama rayi* (p. 257)

Smallscale pomfret Grande castagnole

Brama rayi (Bloch) 1791

DESCRIPTION: Body oblong, compressed, greatest depth 3 in total length at middle of high portion of dorsal; caudal peduncle moderately small. Head blunt, profile curved, compressed, 4½ in total length; mouth terminal, oblique, lower jaw projecting, angle of mouth under front of eye, slender teeth in jaws and on palatines. Eye 6 in head. Fins: dorsal (1), III, 32, first portion high, 2½ in body depth, rapidly decreasing to much shorter rays, fin begins over middle of pectoral and ends on caudal peduncle; caudal deeply lunate, broad, distance between lobe tips about ⅔ body depth; anal, II, 27, similar in shape to dorsal but a little shorter; pectorals large, triangular, base low on side somewhat behind gill opening, fin length ¾ of body depth, directed obliquely upward; pelvics small, ventral, under or behind base of pectorals. Scales small, about 80 in median longitudinal row; parts of head and soft part of dorsal and anal fins scaly; in younger fish each scale has a bony ridge or spine running forward under preceding scale. Lateral line present.

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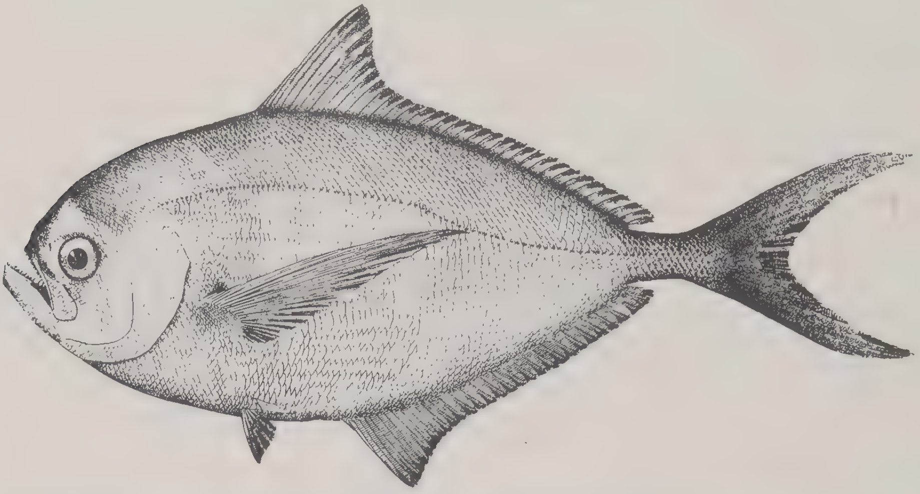
* Not "60 miles south-southwest of Cape Sable in the deep gully between Browns and Georges Banks . . . ." as stated by Bigelow and Schroeder.[49]



Colour, dusky with soiled-silvery tints; snout, opercle, and median fin margins, black.

Distinctions: The smallscale pomfret has 80 scales in median line as compared with 40–50 in the bigscale pomfret; its pelvic fins are distinctly under the base of the pectorals, whereas those of the bigscale pomfret are in front of the pectorals. The lateral line is developed in the smallscale pomfret but obsolete in the bigscale pomfret.

Size: Said to reach a length of 2–4 feet.[234]

Range: Open seas down to considerable depths. Rare on coast of North America where it is reported from Grand Bank and Woods Hole, Massachusetts. At Bermuda and on the European coast north to the Faroes Islands. Occasionally seen in markets on the Mediterranean Sea coast; on the Pacific coast from California to Puget Sound and off Japan.

Canadian distribution: Recorded only from Grand Bank. The U.S. National Museum records a specimen (No. 26234) apparently taken on the western edge of the Grand Bank in 120 fathoms of water in 1881 or earlier.

Bigscale pomfret — Castagnole de Madère

Taractes longipinnis (Lowe) 1843

Other common names: Johnson's seabream

Description: Body ovate, compressed, greatest depth 2½ in total length at origin of dorsal fin; caudal peduncle small. Head, blunt, compressed, about 4 in total length; mouth terminal, oblique, lower jaw projecting, angle of mouth under front of eye; small teeth in jaws. Eye large, deeper than long, horizontal diameter almost 5 in head. Fins: dorsal (1) III, 32, long, first portion high ($1\frac{3}{4}$ in depth of fish) and scythe-shaped, followed by a low frilled section of 18 or 19 semi-divided groups of short rays, fin originates about $\frac{2}{5}$ of body length from snout and terminates on caudal peduncle; caudal large, deeply lunate, distance between lobe tips $\frac{4}{5}$ of body depth; anal II, 26, very similar in shape to dorsal, beginning under posterior part of high section of dorsal and ending under end of dorsal; pectorals $\frac{3}{5}$ of body depth in length, base placed low on body somewhat behind gill opening, the fin directed obliquely upward; pelvics small, ventral, slightly in front of base of pectorals. Body and much of head covered by scales that vary greatly in size, smallest on head and anterior dorsal and ventral portions of body, largest in area about tip of pectoral fin, larger scales with irregular concave posterior edges; about 43 scales in median, longitudinal line. Lateral line absent.

Colour, body and head of dead specimen blackish, tinged with salmon on gill covers and sides; dorsal and anal fins dusky; caudal black with white concave margin; pectorals gray.[49]

DISTINCTIONS: The scythe-shaped dorsal and anal fins with their low subdivided continuations are distinctive. Bigscale pomfret may be distinguished from the smallscale pomfret by its larger scales (the bigscale pomfret has 40–50 in the median line, the smallscale pomfret about 80). The pelvic fins of the bigscale pomfret are located before the pectorals; in the smallscale pomfret they are under the pectorals.

SIZE: Up to a length of about 3 feet.[49]

RANGE: Both sides of the North Atlantic Ocean, but known only from Madeira in the east and Browns Bank in the west.

Canadian distribution: The only reason for including this species here is that a 33-inch long specimen was caught on Browns Bank, about 50 miles southwest of Cape Sable, N.S., on January 10, 1928, and reported by Bigelow and Schroeder[44] as *Taractes princeps* (Johnson) 1863.

Family SCIAENIDAE Drums or croakers

The drums are a rather large family of medium-sized fishes that frequent shallow, inshore marine waters. One species is rather widely distributed in the fresh waters of eastern and central North America. Many are good food fishes. They are called drums, or croakers, because of the peculiar noises they make. Creatures of warmer seas, only the occasional stray finds its way into our area.

KEY to Family SCIAENIDAE

Barbels present on lower jaw; mouth somewhat inferior .... Black drum, *Pogonias cromis* (p. 261)

No barbels present on lower jaw; lower jaw distinctly projecting .... Weakfish, *Cynoscion regalis* (p. 260)

Weakfish — Acoupa royal

Cynoscion regalis (Bloch and Schneider) 1801

Other common names: squeteague, sea trout

Description: Body elongate, fusiform, greatest depth at middle of spinous dorsal fin is 4½ in total length, little compressed; caudal peduncle stout. Head 4½ in total length, conical, rather pointed; mouth large, terminal, its angle under posterior part of eye, lower jaw projecting, upper jaw only with 2 long canine teeth, narrow bands of sharp teeth on sides of upper and lower jaws. Eye 7 in head. Fins: dorsals (2), 1st X, roughly triangular, second spine longest being 2½ in head, base of fin equals ⅔ length of head, originating over middle of pectoral, 2nd dorsal, I, 26–29, roughly rectangular, rays 3½ in head, scarcely any space between it and spinous fin, its base slightly longer than head, terminating on base of caudal peduncle; caudal large, end slightly concave; anal, II, 11–12, spines slender, longest soft rays 2½ in head, base 3 in head, originates under middle of 2nd dorsal; pectorals slim, pointed, a little more than ½ length of head, located behind gill opening midway between lateral line and ventral edge; pelvics roughly triangular, almost as long as pectorals, located on ventral edge a trifle posterior to bases of pectorals. Lateral line distinct, very slightly arched. Body covered with moderate-sized scales.

Colour, dark olive-green above, with back and sides variously burnished with many colours from purple through green to golden, and marked above the lateral line with many small, irregular, dark to bronze spots that form irregular lines; lower surfaces white to silvery; dorsal fins dusky, tinged with yellow; yellow tints on all other fins.[49]

Distinctions: The weakfish is distinguished from the striped bass and white perch by its more slender form and by the presence of 2 weak anal spines instead of the three stouter ones possessed by the basses. The lack of space between the dorsal fins and the absence of finlets separate it from the mackerels.

Size: Weakfish average 5 pounds or less and fish longer than 3 feet and a weight of 12 pounds are rare according to Bigelow and Schroeder.[49]

Range: Eastern coast of the United States from Massachusetts Bay to Florida, straying northward occasionally to Nova Scotia.

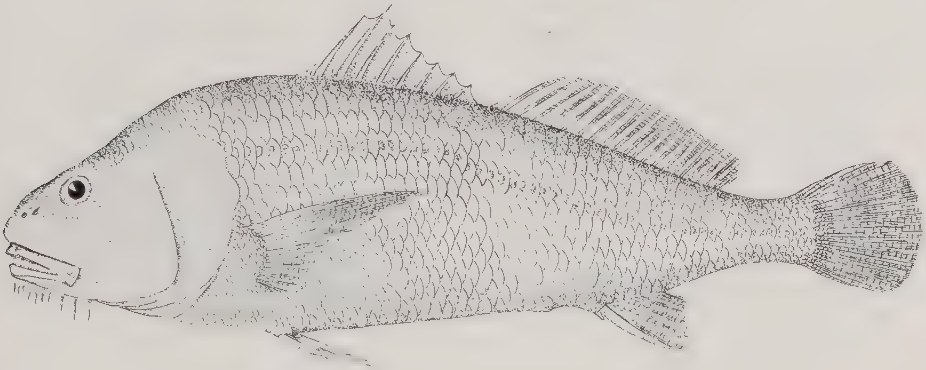
Canadian distribution: The weakfish is rare in Canadian waters. It has been reported in the Bay of Fundy[166] and off Nova Scotia.[184] A single headless specimen was sent to the Biological Station, St. Andrews, New Brunswick, in September 1955 and is preserved there. It was caught in a weir at Economy, Minas Basin, Nova Scotia, and had a calculated total length of 19 inches.

Biology and Economics: Weakfish are found in northern waters only in summer and autumn. They have been caught in winter off Cape Hatteras and occasionally off Rhode Island in 50 fathoms. They frequent shallow shore waters in summer, usually over sandy bottom. They move in schools. Spawning occurs from May to October. The eggs are spherical, small, being about $\frac{1}{32}$ inch in diameter, with one or more oil globules; they are buoyant and hatch in 2 days or less at 70 F. The species reaches a length of 18 inches in 5 or 6 years. Food consists of crabs, shrimp, amphipods, shelled molluscs, annelid worms, and small fishes such as herring, menhaden, butterfish, scup, silversides, and mummichogs. They are voracious feeders.[49]

Black drum **Grand tambour**

Pogonias cromis (Linnaeus) 1766

This species was recently reported to occur in Canadian waters as a result of a capture of a large specimen by Dr J. S. Bleakney.[60] The specimen, which measured 39¼ inches long, was caught in a weir in the Bay of Fundy at Hall's Harbour, Kings County, Nova Scotia, in 1947. The exact date of capture was not recorded. The specimen, which was mounted by Dr Bleakney, was readily identifiable as a black drum.



Family MULLIDAE Surmullets

This is a small family of brightly coloured fishes that frequent subtropical and tropical seas. All are characterized by the presence of two long barbels attached to the lower jaw, just posterior to the mandible itself. Although there are many species in the family only one strays into our area.

Red goatfish **Rouget doré**

Mullus auratus Jordan and Gilbert 1882

OTHER COMMON NAMES: red mullet, northern goat fish, surmullet

DESCRIPTION: Body heaviest forward, gradually tapering to a stout caudal peduncle, greatest depth 5 in total length at origin of 1st dorsal fin. Head 4 in total length; snout profile steeply rounded; mouth terminal but inferior, small teeth in lower jaw only, large patches of larger teeth on vomer and palatines; 2 fleshy barbels on lower jaw, each slightly over ½ length of head. Eyes high on sides of head, 3⅔ in head length. Fins: dorsals (2), 1st, VII, spinous, first ray longest, ⅔ length of head, situated a distance equal to its own height behind eye, 2nd dorsal, I, 8, a little smaller than 1st dorsal, separated from 1st dorsal by a space equal to about ½ base length of 1st dorsal; caudal large, deeply forked; anal, II, 6, about equal to 2nd dorsal and located under it; pectorals moderate, on sides behind gill openings, tips reaching level of posterior end of 1st dorsal; pelvics larger than pectorals, located ventrally slightly in front of pectorals. Lateral line straight, pronounced. Scales moderately large, covering body and part of head.

Colour, scarlet to crimson; sides with two distinct longitudinal stripes; first dorsal pale with an orange band at base and a yellow band nearer tip; second dorsal mottled scarlet and pale; caudal scarlet; pectorals reddish; other fins plain; silvery lustre on sides of head.[336]

DISTINCTIONS: The red goatfish can be recognized by its crimson colour, two dorsal fins, its pair of fleshy barbels on the lower jaw, and the forward position of the pelvic fins, below or in front of the pectorals.

SIZE: It is said to grow to a length of 8 inches.[336]

RANGE: Along coast of North America from Cape Cod to Florida. Straying to Nova Scotia.

Canadian distribution: A specimen, 3 inches long, was seined at Eastern Passage, Halifax County, N.S., on October 12, 1928.[264, 498] The water was warm in 1928 and several southern strays were caught in the area.

Family SPARIDAE — Porgies

The porgies are widely distributed fishes of warm seas and are close relatives of the sea basses. Some species grow to 20 pounds or more, and a number of species are highly regarded as food fishes.

Only two species have been reported from our region, one being doubtful.

KEY to Family SPARIDAE

Tips of pelvic fins reaching and overlapping anus; caudal fin lunate, the tips pointed .... Scup, *Stenotomus chrysops* (p. 264)

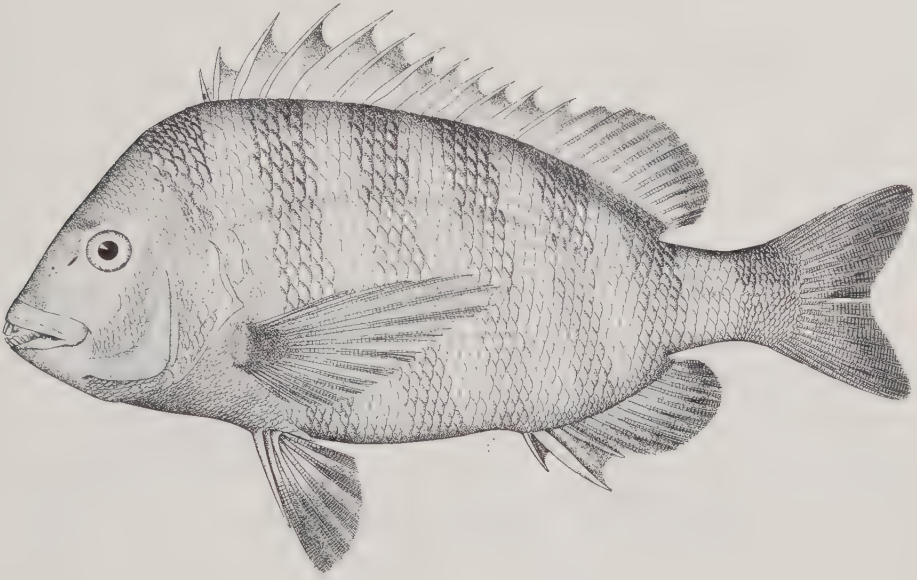
Tips of pelvic fins not reaching to anus; caudal fin with shallow fork, tips rounded .... Sheepshead, *Archosargus probatocephalus* (p. 262)

Sheepshead — Spare tête-de-mouton

Archosargus probatocephalus (Walbaum) 1792

OTHER COMMON NAMES: sheepshead porgy

DESCRIPTION: Body robust, short and deep, greatest depth at 6th dorsal spine 2⅗ in total length, compressed, caudal peduncle stout ¼ as deep as body. Head almost 4 in total length, deep, pointed, compressed, upper profile almost straight; mouth terminal, small, angle of jaw in front of eye, teeth in front of jaw prominent, broad, followed by smaller molars. Eye 6 in head. Fins: dorsal (1), XI–XII, 11–13, originating over gill opening and ending on caudal peduncle, spinous portion over ⅔ of whole length of fin, third and fourth spines longest, over ½ length of head, preceded and followed by shorter spines, soft rays longer than immediately preceding spines, somewhat less than head length, whole fin depressible in groove; caudal moderate, not deeply forked, tips rounded; anal, III, 10–11, spines heavy, second longest



fin originates under last spine of dorsal and ends under tip of soft dorsal, depressible in a groove; pectorals somewhat pointed, longer than head, base is behind gill opening and low on side; pelvics roughly triangular, shorter than pectorals and located on ventral edge under base of pectorals. Lateral line indistinct, arched. Large scales cover body and head behind mouth and eyes; scales in front of bases of pectorals and pelvics smaller.

Colour, grayish to greenish-yellow, with about 7 broad, brown to black bands running vertically on body.

Distinctions: The sheepshead closely resembles the scup but can be distinguished from it by the broad incisor teeth, the slightly forked tail with rounded lobe tips, whereas the scup has small teeth and a lunate tail with pointed lobes. The profile of the head is not slightly concave as in the scup.

Size: The sheepshead reaches a length of 30 inches and a weight of about 20 pounds.[49]

Range: From Cape Cod to the Gulf of Mexico, possibly straying to the Bay of Fundy.

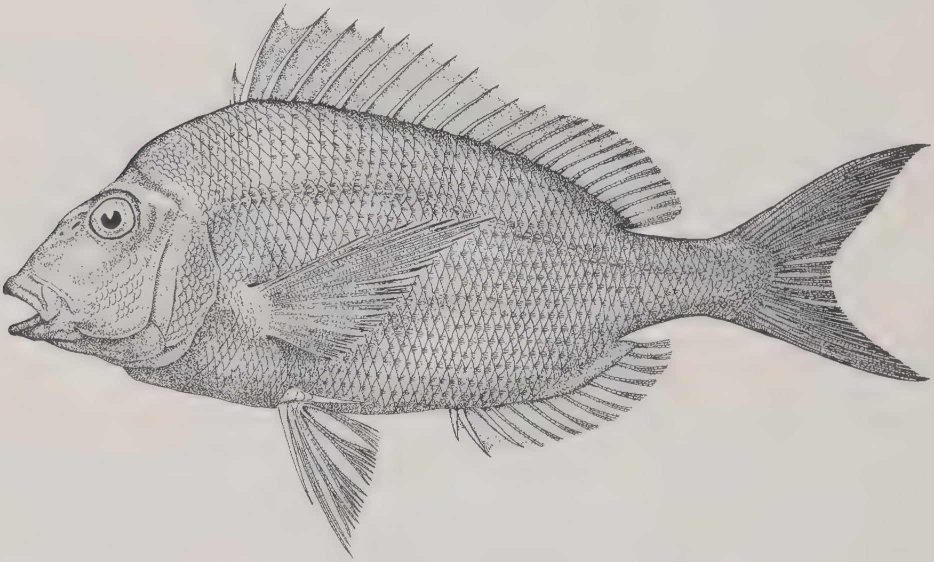
Canadian distribution: Reported from Saint John Harbour, New Brunswick, by Cox.[93] As noted by Bigelow and Schroeder[49] this record of Cox's is the only known report north of Cape Cod, and it seems likely to us that another species was involved.

Scup **Spare doré**

Stenotomus chrysops (Linnaeus) 1766

OTHER COMMON NAMES: porgy

DESCRIPTION: Body ovate-elliptical, greatest depth at 5th dorsal spine being 2½ in total length, much compressed; caudal peduncle stout, ¼ as deep as body. Head 4⅓ in total length, bluntly pointed, compressed, profile slightly concave above eye; mouth terminal, small, angle much before eye, teeth in jaws narrow, conical, molars in 2 rows above. Eye 5 in head. Fins: dorsal (1), XII, 12, preceded by a forward-pointing spine, first spine shorter than the others, 3rd spine longest ⅗ length of head, soft rays a little longer than last spiny ones, last rays only a trifle shorter, fin originates over base of pectoral and continues to base of caudal peduncle, entire fin can be depressed in a groove along midline of back; caudal large, lunate, tips pointed; anal, III, 11–12, spines heavy, second and third twice as long as first which equals diameter of eye, soft rays equal to length of longer spines, begins under middle of dorsal and ends on base of caudal peduncle, its base ½ as long as that of dorsal, depressible in a groove; pectorals long, 1⅓ times length of head, broadly pointed, located behind gill opening midway between lateral line and ventral edge; pelvics large, length slightly less than head, triangular, on ventral edge, base under base of pectorals. Lateral line arched. Scales large, covering body and head behind mouth and eyes; a prominent scaly sheath along the base of the soft portions of dorsal and anal fins.



Colour, dull silvery and iridescent, somewhat darker above than below; the sides and back with 12–15 indistinct longitudinal stripes, flecked with light blue and with a light-blue streak following base of dorsal fin. Head silvery with dusky blotches. Belly white. Median fins dusky, flecked with blue; pectorals brownish, pelvics white to bluish.[49]

DISTINCTIONS: The scup can be readily separated from the striped bass and the white perch by its continuous dorsal fin, in which the spiny portion is higher than the soft part. Its jaws are nearly equal in length and the gill cover is not produced into spines as it is in the redfish. The shape of the body suggests the butterfish which has smaller scales and lacks spiny fin rays. Its small teeth and lunate, pointed tail separate it from the sheepshead.

SIZE: Scup reach a length of 18 inches and a weight of 3–4 pounds.

RANGE: East coast of North America from Sable Island Bank to North Carolina; infrequent north of Cape Cod. Another species occurs south from Cape Hatteras.

Canadian distribution: The earliest Canadian reference to this fish was from St. Mary Bay, Nova Scotia[247] and, while these records were based on reports only, subsequent finding of the fish there lends support to the report. On September 29, 1950, the M.V. *J. J. Cowie* caught an 8 inch specimen in a flounder drag in St. Mary Bay. One 9½ inches long was caught by the same boat in Passamaquoddy Bay in December 1954; one of similar size was caught on Sable Island Bank in April 1955 by the dragger, *Donna Louise*; one 12 inches long was caught in the Bay of Fundy at Harbourville, Nova Scotia, in July 1955. These four specimens are preserved at the Biological Station, St. Andrews, N.B. On October 15, 1959, a 10-inch specimen was caught in a trawl off Pendleton Island, Passamaquoddy Bay, New Brunswick, and is in the Royal Ontario Museum (Cat. No. 22067). The scup has been reported at Eastport, Maine, just outside the Canadian border.[239]

BIOLOGY AND ECONOMICS: Scup usually occur in schools inshore in summer and offshore in depths up to 70 fathoms in winter. They are bottom feeders, eating most bottom invertebrates, such as amphipods, worms, sand dollars, and young squid. Occasionally, fish fry and other pelagic forms are eaten. They spawn from May to August. The eggs are spherical, transparent, about 0.9 mm in diameter, with one oil globule, and are buoyant.[49]

No commercial quantities of scup are found north of Cape Cod. Approximately 10 million pounds have been caught south of Cape Cod in some years. It is also sought after by anglers.[49]

Family CHAETODONTIDAE — Butterflyfishes

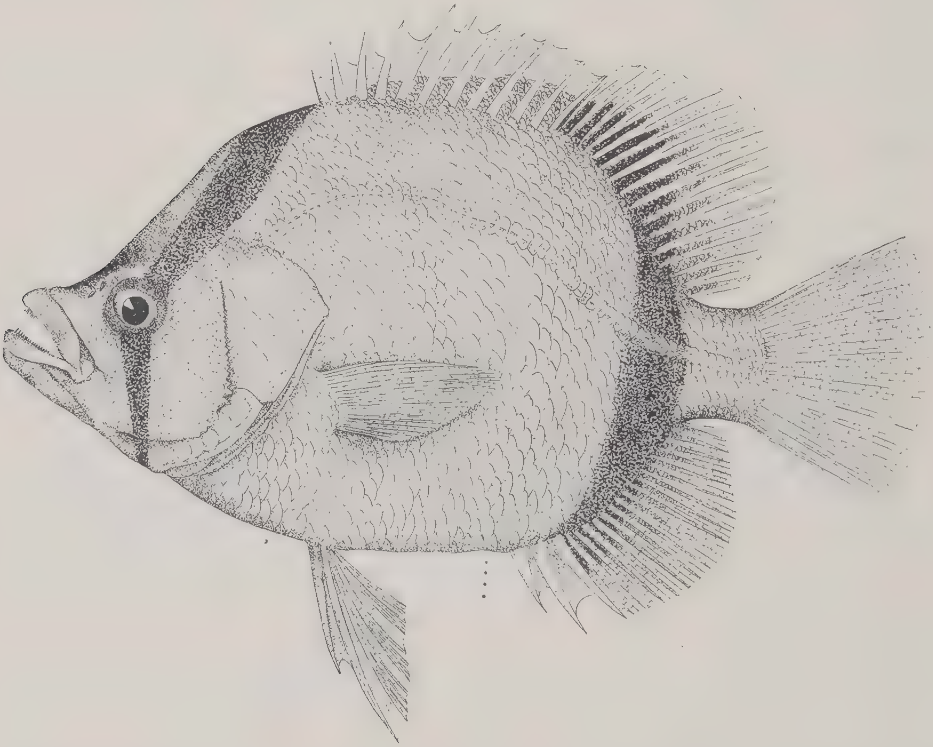
This is a rather large family of small, active, and colourful fishes characteristically found in warm seas around coral reefs.

Only one species has been found in Canadian waters. It is unusual, indeed, for such fishes to stray so far northward.

Spotfin butterflyfish — **Palhala**

Chaetodon ocellatus Bloch 1787

DESCRIPTION: Body sub-rhomboidal, greatest depth 2 in total length under 8th spine of dorsal fin; very much compressed; caudal peduncle moderate. Head small, 3 in total length, pointed, upper profile slightly concave below eye and convex above it; mouth small, terminal, lower jaw projecting slightly, angle of mouth well in front of eye; long, slender, bristle-like teeth in jaws. Eye 3 in head. Fins: dorsal (1) XII–XIII, 20, length of first spine less than eye diameter, of second spine 1¼ times eye diameter and of third spine twice eye diameter, the remainder somewhat shorter, soft part of fin adjoins spinous part without any division, its middle rays longest, being 1½ times diameter of eye, fin extends from above gill opening to caudal peduncle; caudal moderate, rounded; and anal III, 16, the spines very strong, the length of the first less than diameter of eye and of second and third about 1⅓ times diameter of eye, soft rays uniform until ninth ray then decreasing in length, located under soft part of dorsal; pectorals somewhat narrow and rounded, length almost twice diameter of eye, located low on body behind gill opening; pelvics larger than pectorals, sail-shaped, with narrow base, first ray a strong spine, located ventrally just behind base of pectorals. Lateral line arched upward, ending under posterior tip of dorsal fin. Scales large, covering body, upper part of head and base of dorsal fin.



Colour, golden-gray; a large non-ocellated dark spot on base of soft dorsal and an indistinct band extending vertically from this spot down to and along the base of the anal fin; a small black spot on the tip of the soft dorsal (except in the young); a narrow dark band passes through the eye, extends upward to the base of the dorsal fin and downward to the ventral edge of the head.[234]

DISTINCTIONS: The spotfin butterflyfish resembles the redfish, cunner, and tautog in having the spinous and soft-rayed portions of the dorsal fin continuous. It differs from them in having no perceptible break in the fin at that point, in being much deeper, and in the colour pattern.

SIZE: Up to a length of 8 inches.[513]

RANGE: West Indies, among coral reefs; straying north to New Jersey, Rhode Island, and Massachusetts, and once to Nova Scotia.

Canadian distribution: This species has been recorded only once, by Vladykov[498] on the basis of a young specimen, 1¼ inches long, caught in Musquodoboit Harbour, Nova Scotia, in summer 1933.

Family LABRIDAE — Wrasses

This is a large family of fishes of variable sizes and often vividly coloured, occurring principally in warm seas around coral reefs and feeding mainly upon bottom creatures such as molluscs and crustaceans.

Two species are established in the Canadian region.

KEY to Family LABRIDAE

Base of pelvic fins located below base of pectoral fins; front of head distinctly rounded in lateral view; lower half of operculum without scales .... Tautog, *Tautoga onitis* (p. 267)

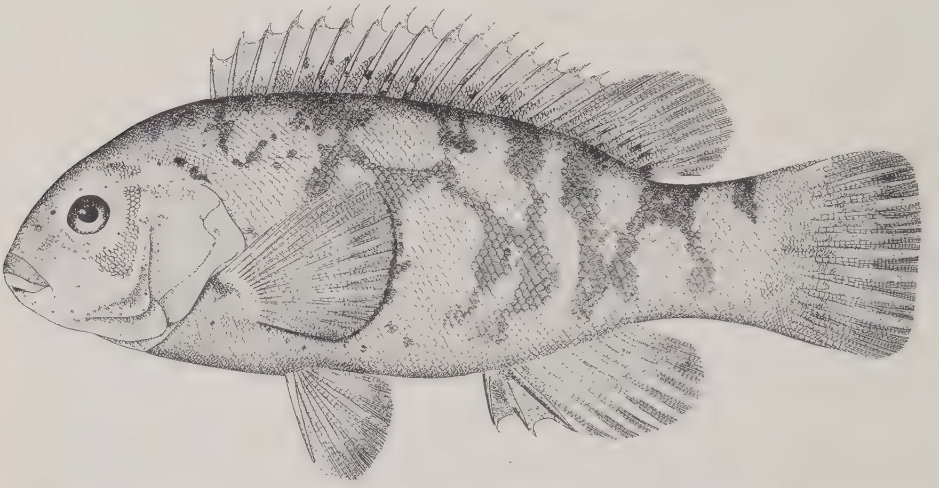
Base of pelvic fins located obviously behind base of pectoral fins; front of head distinctly pointed in lateral view; lower half of operculum with scales .... Cunner, *Tautogolabrus adspersus* (p. 269)

Tautog — **Tautogue noir**

Tautoga onitis (Linnaeus) 1758

OTHER COMMON NAMES: black-fish

DESCRIPTION: Body stout, oblong, somewhat compressed, depth 3⅓ in total length, occurring about middle of dorsal spines; caudal peduncle stout, approximately ½ as deep as body. Head 3¾ in total length, blunt, upper profile steep and rounded; mouth terminal, but low, small, angle well in front of eye, lips very thick, 2 series of stout, conical teeth in each jaw, the front ones largest and 2 groups of rounded crushing teeth at rear of mouth. Eye moderate, 6 in head. Fins: dorsal (1) XVI–XVII, 10, spines strong, each with a small cutaneous appendage at tip, first 3 spines gradually increasing in length, remainder about equal, the spines (without cutaneous tip) about 3 in head, soft rays longer, the middle ones less than 2 in head, fin begins over posterior edge of head and extends to caudal peduncle, its base nearly twice length of head; caudal stout, truncate, its maximum width 1½ times depth of caudal peduncle; anal III, 7–8, spines stout, increasing in length to third which is 2½ in head, soft part of fin rounded, middle rays longest being 1¾ in head, fin begins under thirteenth dorsal spine and ends under posterior edge of dorsal fin; pectorals moderately large, rounded, longest rays 1½ in head, base behind gill opening, with a scaled area between this and lower part of base, base about midway between lateral line and ventral edge; pelvics I, 5, roughly triangular, spine strong, longest soft ray 2 in head, located ventrally under middle of pectoral fins. Body covered with moderate scales; membrane of dorsal and anal fins partly scaled; small scales on head behind and below eye and on upper part of preopercle; lower and posterior part of gill cover without scales. Lateral line continuous, curved downward under soft rays of dorsal fin.



Colour, blackish pigment, grayish or greenish; sides irregularly dark mottled, especially in smaller specimens; large fish uniformly blackish; belly slightly paler than sides; chin whitish in large specimens.

DISTINCTIONS: The tautog and cunner are distinguished from other fishes with continuous spinous and soft-rayed dorsal fins by the small mouth and rounded, or truncate, caudal fin. The tautog differs from the cunner in having a steep, rounded dorsal profile for the head; in being stouter than the cunner and, in the case of large ones, much heavier. The lower gill cover is naked in the tautog and scaled in the cunner. The pelvic fins of the tautog are farther back than those of the cunner.

SIZE: The tautog reaches a maximum length of about 3 feet. The United States National Museum has a record specimen 36½ inches long and weighing 22½ pounds. Specimens weighing over 10 pounds are rare.[49]

RANGE: Atlantic coast of North America from slightly east of Halifax, Nova Scotia, to South Carolina; most abundant between Cape Cod and Delaware Bay.

Canadian distribution: Previous to 1957 tautog were rarely reported from Canadian waters. Two specimens are in the Nova Scotia Museum of Science, Halifax, N.S., one from Petpeswick Harbour, Halifax County, May 1903, and one from Scotsman Bay, N.S., in the upper Bay of Fundy, July 1902.[513] One was caught at Cranberry Head,* Bay of Fundy, Cumberland County, N.S., in 1912.[140a] There are 3 records for Passamaquoddy Bay, one about 1910,[205] and two from Oak Bay, an estuary from Passamaquoddy, in 1934 and 1935.[324] Much earlier it had been reported as occurring in Saint John Harbour.[318] In 1957 and 1958 large numbers were caught in Eel Brook Lake, Yarmouth County, N.S.

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*Bleakney[59] has shown that Cranberry Head, "Yarmouth County," reported by authors subsequent to Fowler[140a] was in error.

Biology and Economics: The tautog is confined more closely to the coast than the cunner and in the northern part of its range is not caught offshore at all; at times it enters brackish water. Spawning takes place in June near Cape Cod. Bleakney[59] captured a 6-pound female in July 1962, the ovaries of which contained ripe eggs. The eggs are buoyant and about 1.0 mm in diameter.

The food of the tautog consists mainly of mussels, gastropods, and other molluscs and crustaceans. Those caught recently in Nova Scotia were eating mussels extensively.

A sport fishery for tautog developed in 1957 in Eel Brook Lake, a saltwater estuary in Yarmouth County, N.S. It is estimated that 2000 tautog were caught there in 1957 and that about 450 were caught in 1958. They were caught mainly by hook and line.

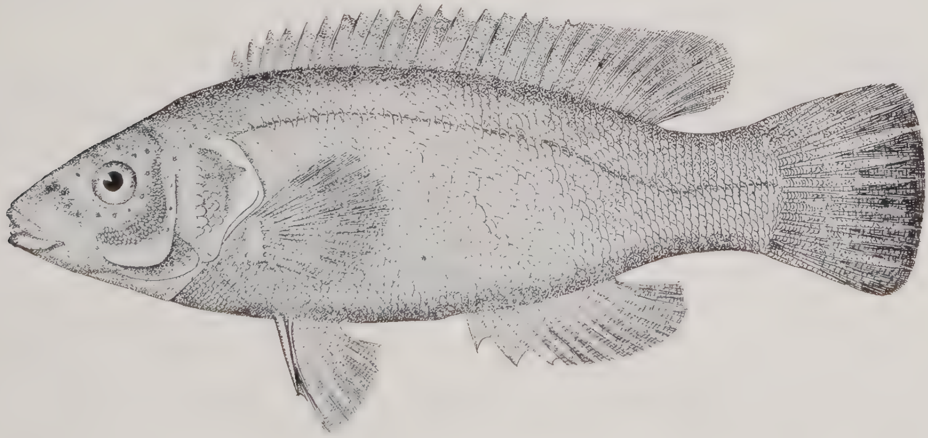
Cunner

Tanche-tautogue

Tautogolabrus adspersus (Walbaum) 1792

Other common names: perch, sea perch, blue perch, bergall, nipper, achigan de mer, tanche, vieille

Description: Body oblong, moderately compressed, greatest depth 3⅔ in total length occurring at seventh dorsal ray; caudal peduncle stout, deep, equalling ½ of maximum body depth. Head 3⅔ in total length, pointed, upper and lower profiles almost straight; mouth terminal, thick-lipped, angle well in front of eye, several series of teeth in jaws, unequal, conical, outer ones strongest, strong teeth in rear of mouth also, vertical edge of preopercle finely serrated. Eye moderate, 5½ in head. Fins: dorsal (1) XVIII, 9–10, first 3 spines gradually longer, remainder fairly uniform, their length 2½ in head, all soft rays except last a little longer, making a somewhat rounded tab on posterior end of fin, fin begins just in advance of posterior tip of head and ends at caudal peduncle, its base a little less than twice head length; caudal heavy, rounded; anal III, 9, the 3 spines stout and graduated, third equalling longest dorsal spines, soft rays a little longer, fin originates under fourteenth spine of dorsal and ends a



trifle in advance of end of soft dorsal, its base 1½ in head length; pectorals moderate, rounded, longest rays 2 in head, a scaled area between gill opening and lower part of base, base about midway between lateral line and ventral edge; pelvics, I, 5, moderate, roughly triangular, spine stout, first and second soft rays about 2 in head, base ventral under lower part of base of pectorals. Body covered with large, rough scales; some scales on gill covers. Lateral line continuous, arched.

Colour, variable, depending on background; variously mottled with brown, reddish, and blue, one of these predominating; occasionally with some dull olive-green; those from deeper water tend to be red; belly usually with a bluish cast, but sometimes whitish; lips sometimes yellow. Up to length of about 4 inches young cunner have a distinctive black spot at the front of the soft dorsal fin, immediately following the last spine.

Distinctions: The cunner is recognized as a perch-like fish with spines and soft rays forming a long, continuous dorsal fin. Other marine fishes that share this character include the wreckfish, scup, sheepshead, redfish, and tautog. The combination of rounded tail and small mouth of the cunner separates it from all but the tautog. The cunner has an almost straight profile from the snout to the base of the dorsal fin, while the tautog has a very distinctly rounded profile; the caudal peduncle is narrower and the caudal fin relatively wider in the cunner than in the tautog; the gill cover has a larger scaled area in the cunner than in the tautog, there being a naked area in front of the gill opening in the latter species.

Size: Up to a length of 17 inches and a weight of 3¼ pounds; usually not over 12 inches long.

Range: Atlantic coast of North America from northern Newfoundland, the southern Gulf of St. Lawrence and offshore Banks, south to the mouth of Chesapeake Bay.

Canadian distribution: Adults occur along the west coast of Newfoundland at Port-au-Choix, Brig Bay, Old Ferolle Harbour, and as far north as Flower's Cove, while fry have been towed in the Strait of Belle Isle off Cape Norman;[206] pelagic fry have been found at St. Georges Bay, Nfld.;[19, 102] in Bay of Islands,[226] and off Bonne Bay;[17] elsewhere in the Gulf of St. Lawrence cunner are reported from Gaspé, P.Q.;[450] in Chaleur Bay at Port Daniel, P.Q.;[229] in the Miramichi estuary;[312] at Tignish, P.E.I.;[92] in Malpeque Bay, P.E.I.;[334, 450] pelagic fry in Northumberland Strait;[102] abundant at the Magdalen Islands, P.Q.;[17, 95] abundant on the Cape Breton shore.[95, 102, 451] Found sparingly in Conception Bay, Nfld.;[226, 228] reported as pelagic fry from Fortune Bay, Bay Bulls, southwestern Grand Bank, off Bonavista, off Notre Dame Bay, and off St. Julien, Nfld.[17, 18, 19] Pelagic young were also found on Sable Island Bank.[102] On the outer coast of Nova Scotia adults are reported as abundant at Canso, N.S.,[91] and all along the coast generally.[226, 232, 515] Less general in the Bay of Fundy, although abundant in St. Mary Bay; less common in the Annapolis Basin; found sparingly from Grand Manan to Passamaquoddy Bay;[205] recorded east of Saint John Harbour at Black River, N.B.[348]

Biology and Economics: Cunner live on or near bottom, mostly within a few miles of shore; they often congregate around wharves, wrecks, floats, and submerged seaweed; they avoid brackish water. A few large ones have been caught offshore on Georges Bank and elsewhere in depths up to 70 fathoms. They rarely migrate.

Occasionally mass mortalities have occurred in winter. These have been attributed to the cunner's inability to withstand low temperatures.[49]

Cunners spawn from June through to mid August in the Gulf of St. Lawrence, and a little later on the Nova Scotian coast.[226, 380] The eggs are spherical, about 0.8 mm in diameter, and they are buoyant. They hatch in 40 hours at 70 F and in about 3 days at 55–65 F.[49] Spawning is successful in the Gulf of St. Lawrence, off southern Newfoundland,[17, 18, 19, 102] and in St. Mary Bay, particularly the upper half; but little spawning occurs in the colder Bay of Fundy and no fry have been found there.[380]

The growth of cunner from the Gulf of St. Lawrence has been studied by Johansen.[226] They reach a length of 6½ inches in 4 years. A male takes 7 years to reach 9½ inches while a female takes 6 years to reach that length.

The cunner feed principally on molluscs and crustaceans, such forms as limpets mussels, periwinkles, crabs, shrimp, mysids, and amphipods being found in their stomachs. Other less frequent items in the diet include barnacles, sea urchins, marine worms, sea squirts, fish eggs, and eelgrass.[226]

Cunner have had little commercial use in Canada. Before 1900 some were caught for local consumption in the Gulf of St. Lawrence;[226] during the same period there were small landings in New England.[49] At present they provide some angling at wharves in districts where they are abundant.

Family AMMODYTIDAE — Sand lances

The sand lances are small, elongate, carnivorous fishes, somewhat eel-like in general appearance, frequenting shoal waters, and often burying themselves in the bottom sand. They differ from many other families in the suborder Percoidea in that there is no spinous dorsal and the soft-rayed dorsal is low and long; there are no spines in the anal fin, pelvic fins are absent and the scales are cycloid and small; the lateral line is high and straight, and a fleshy ridge located low on the flanks extends for the length of the body.

This family contains relatively few species in northern seas. Sometimes forming large schools, they occasionally constitute a significant part of the diet of commercially important species such as cod and haddock. The relationships of the species said to occur in North Atlantic waters are in need of careful study. In recognizing two species* from our area we are in agreement with Backus.[25]

KEY to Family AMMODYTIDAE

Dorsal fin rays 57–60; anal fin rays 28–31; vertebrae 64–69 .... American sand lance, *Ammodytes americanus* (p. 272)

Dorsal fin rays 62–67; anal fin rays 32–35; vertebrae 71–75 .... Northern sand lance, *Ammodytes dubius* (p. 273)

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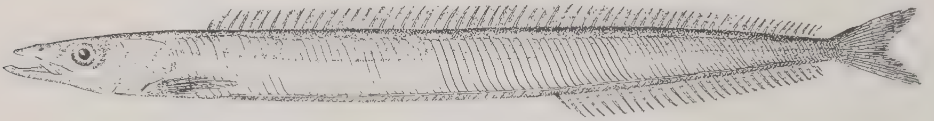
* Recent publication by Richards, Perlumutter and McAneny[382] suggests that two species exist in the North West Atlantic region, *A. hexapterus* and *A. dubius*. The authors suggest that *A. hexapterus* is the inshore form and *A. dubius* the offshore form.

American sand lance — Lançon d'Amérique

Ammodytes americanus DeKay 1842

OTHER COMMON NAMES: sand launce, sand eel, lance, lant, equille

DESCRIPTION: Body elongate, very slender, slightly compressed, greatest depth 13 in total length, depth uniform from gill opening to beginning of anal fin, thence slowly tapering and merging with a stout caudal peduncle. Head long, 5½ in total length, pointed; mouth terminal, lower jaw projecting markedly, angle of mouth slightly in front of eye, jaws without teeth. Eye moderate, 7 in head. Fins: dorsal (1) 57–60,[25] first ray short, most rays 6 in head, gradually decreasing posteriorly, fin long, beginning over posterior third of pectoral and extending to caudal peduncle, base 1½ in total length; caudal moderate, forked, a space separates it from dorsal and anal; anal 28–31,[25] rays a trifle longer than those of dorsal, fin originates under 29th or 30th ray of dorsal and ends under posterior tip of dorsal, base 1½ times head length; pectorals small, pointed, longest rays 2½ in head, base located low on sides and a very short distance behind gill opening; pelvics absent. Side of body with about 125–130 lateral skin folds running somewhat obliquely downward and backward, small scales between folds; a low, longitudinal ridge of skin on either side along the belly. Lateral line straight.



Colour, variable; olive, brownish or bluish-green above, lower sides silvery, belly white; an iridescent lustre while living, but lost after death; sometimes a steel-blue stripe along sides.

DISTINCTIONS: The slender, elongate form, combined with the long, low dorsal fin that is definitely separated from the caudal, identifies the sand lances. None of the true eels or eel-like fishes have forked caudal fins as the sand lance has. It has fewer dorsal and anal fin rays than the northern sand lance.

SIZE: Up to a length of 8½ inches.[209]

RANGE: From near Cape Chidley, Labrador, south to Cape Hatteras; inshore and on the banks in sandy locations only. Closely related species occur in Hudson Bay and Strait, at Greenland, Iceland, and from Norway south to Spain; and in the eastern North Pacific Ocean.

Canadian distribution: The most northerly record is from Eclipse Harbour, near Cape Chidley, Labrador;[49] also reported from Saglek Bay at lat 58°30′N;[191] and from a number of points on the Labrador coast from Tessiujarsuk (lat 56°30′N) to St. Lewis Sound (lat 52°15′N).[19, 25, 240] It is reported from both sides of the Strait of Belle Isle.[209, 240, 455] Known in the Gulf of St. Lawrence from the Trois Pistoles region, P.Q.;[357] from Gaspé, P.Q.;[229, 450] Chaleur Bay; common in Miramichi Bay;[312] Malpeque Bay, P.E.I.;[331] abundant at the Magdalen Islands, P.Q.;[95] found at Cheticamp, N.S.[95] Reported all around Newfoundland, often as pelagic fry and somewhat offshore—off White Bay, Notre Dame Bay, Conception Bay, Placentia Bay, and on Grand and St. Pierre banks.[17, 18, 19, 150, 228] Numerous near Canso, N.S.;[91] common on Nova Scotia coast;[232] abundant on Sable Island Bank;[195, 513] and on Banquereau and Middle Ground.[17, 19] Found in St. Mary Bay and sparingly in the lower Bay of Fundy at Grand Manan and in Passamaquoddy Bay.[205]

BIOLOGY AND ECONOMICS: Sand lance, as the name implies, are found on sandy bottom, both inshore and on the banks; they avoid rocky bottom. They occur in large schools and burrow in the sand at times to a depth of several inches; sometimes they remain buried in sand when the tide leaves the area.

Little is known about the spawning and subsequent growth of this species. Its European counterpart spawns in depths of 10 fathoms or so in late autumn and winter, the small, oval eggs adhering to sand grains. The abundance of fry off Nova Scotia and Newfoundland from May onward suggests a similar spawning period here.[102, 150] The frequency with which fry have been found over wide areas of the banks indicates that reproduction is very successful.

Sand lance feed on many kinds of small marine animals, including copepods, marine worms, and fish fry.[49]

American sand lance are eaten by many fishes, but cod, haddock, and hake feed on them so extensively that their indirect value to the commercial fisheries is considerable. Over half of the food of haddock on the Sable Island Bank consists of sand lance.[195] They are also an important food for some whales and porpoises.

Northern sand lance — Lançon du nord

Ammodytes dubius Reinhardt 1838*

OTHER COMMON NAMES: Greenland launce, arctic sand lance

DESCRIPTION: Body elongate, slender, slightly compressed, greatest depth 13½ in total length, depth uniform from gill opening to beginning of anal fin, thence slowly tapering to a stout caudal peduncle, whose depth is over ⅓ maximum depth of body. Head long, 5–5½ in total length, pointed; mouth large, terminal, lower jaw projecting markedly, angle of mouth slightly in front of eye, jaws without teeth. Eye moderate, 7 in head. Fins: dorsal (1) 62–67,[25] longest rays 6 in head, fin long, beginning over posterior third of pectoral and extending to caudal peduncle, base 1½ in total length; caudal moderate, forked, definitely separated from dorsal and anal; anal 32–35,[25] a little higher than dorsal, fin originating under middle of dorsal and ending under posterior tip of dorsal, base 1½ times head length; pectorals small, pointed, longest rays 2 in head, base located low on sides and a short distance behind gill opening; pelvics absent. Sides of body with 141–144 lateral skin folds running somewhat obliquely downward and backward, small scales between the folds. Lateral line straight.

Colour of upper parts of body and of top of head brownish, under parts pale. Caudal fin dusky, other fins colourless.[496]

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* Not all authors agree to the separation of this species from *A. americanus*. Bigelow and Schroeder,[49] and Soldatov and Lindberg[444] question it. While Backus[25] could distinguish the two species on the Labrador coast, Vladykov[496] found a form, that he called *Ammodytes dubius hudsonius*, in Hudson and James bays; it had fin ray counts that overlapped those of *A. americanus*, viz. dorsal 57–65; anal 28–33.

DISTINCTIONS: This species, as it occurs on the Labrador coast, differs from the American sand lance in having more dorsal and anal fin rays and in having a slightly longer head.

SIZE: Up to 8 inches in length.[25]

RANGE: Arctic waters of North America and Europe, south on the Labrador coast to just below Hamilton Inlet. Common at Greenland.

Canadian distribution: Found in James Bay, northwestern Hudson Bay, and on the south side of Hudson Strait;[496] in Ungava Bay;[124] on the Labrador coast at Sloop Harbour,[523] from Hare Harbour and Packs Harbour (near Cartwright).[25]

BIOLOGY AND ECONOMICS: The northern sand lance has only been found in depths up to 17 fathoms,[496] but within these limits where both occur in the same locality, it tends to be farther offshore than the American sand lance, suggesting a preference for colder water.[25]

Family CHIASMODONTIDAE Black swallowers

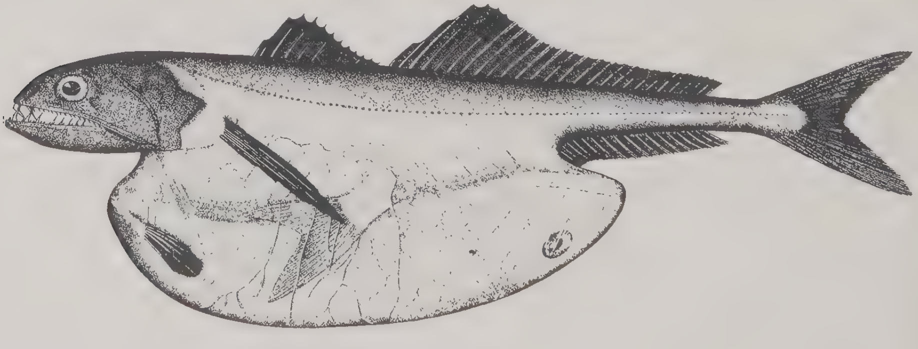
The black swallowers are a small family of small, deep-sea or bathypelagic fishes, widely known because of their ability to swallow fishes many times larger than themselves.

The family contains 5 genera and less than 20 species, but only one species occurs in our area.

Black swallower Grand avaleur

Chiasmodon niger Johnson 1863

DESCRIPTION: Body elongate, compressed, greatest depth, when not distended with food, 9 in total length, occurring immediately behind head, body tapering to a slender caudal peduncle. Head 4½ in total length, blunt, upper profile rounded, lower jaw projecting; mouth large, angle well behind posterior edge of eye, both jaws armed with long, pointed, wide-set teeth, nearly all of which are moveable, the 2 front teeth in the upper jaw very long, crossing each other when depressed, 3 front pairs of teeth in lower jaw similarly prolonged, one long,



fixed tooth on front of palatines, vomerine teeth absent. Eye 5½ in head. Fins: dorsals (2) 1st XI, first 3 spines gradually increasing in length, third spine 3½ in head, remaining spines gradually shorter, base of fin 1⅗ in head, fin originates slightly behind base of pectoral, 2nd dorsal 28, first 3 rays gradually increasing in length, third ray nearly 2 in head, following rays shorter but gradually levelling off so that final 10 rays are almost same height, base of fin 1⅔ times length of head, fin begins a very short distance behind 1st dorsal and extends to caudal peduncle; caudal moderate, forked; anal 27, under and similar in shape to 2nd dorsal, but beginning somewhat behind its origin; pectoral fins long and narrow, ¾ length of head, located low on side a short distance behind gill opening; pelvic fins shorter, ½ length of pectorals, located ventrally slightly in front of bases of pectorals. Lateral line continuous from above gill cover to base of caudal fin. Body scaleless. Body capable of marked distention when large fish are swallowed.

Colour, completely black.

DISTINCTIONS: The black swallower can be distinguished from other fishes of this region by its slender shape (unless distended with food), absence of scales, adipose fin, and photophores, combined with long teeth in the mouth and its black colour.

SIZE: Up to a length of 12 inches.[234]

RANGE: This species has been recorded from Madeira, from near the West Indian island of Dominica, from the mid Atlantic and from Lahave Bank off Nova Scotia. A recent record is from south of Browns Bank.*[498]

Canadian distribution: A specimen was found floating at the surface, over LaHave Bank by a Gloucester, Mass., schooner in June 1880; it is preserved in the United States National Museum.[170] A specimen, 6½ inches long, was picked up, also at the surface, in September 1932, south of Browns Bank.* It was caught by the Captain of a Lunenburg vessel.[498]

Family GEMPYLIDAE — Snake mackerels

This is a small family of rather large, predaceous fishes found in warm seas, sometimes occurring at considerable depths. Some of the species are considered to be good food fishes. However, the relationships of some of the species, especially those resembling *Lepidocybium flavobrunneum*, are not clear, largely because study material has been inadequate.

KEY to Family GEMPYLIDAE

Caudal peduncle keeled; dorsal fin spines 7–12 .... Escolar, *Lepidocybium flavobrunneum* (p. 276)
Caudal peduncle not keeled; dorsal fin spines 13–15 .... Oilfish, *Ruvettus pretiosus* (p. 276)

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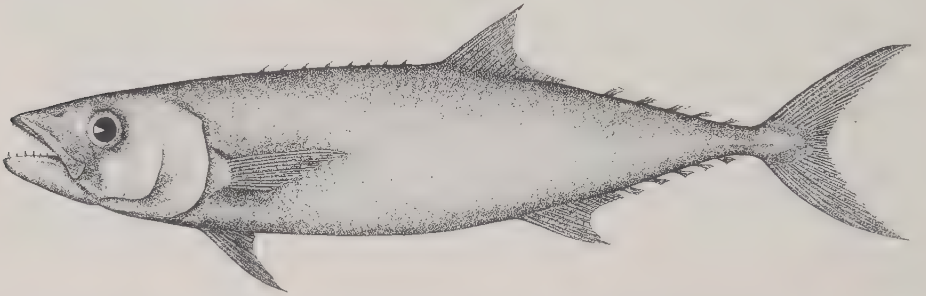
* The position given is lat 39°10′N, long 69°40′W, which is south of Nantucket and probably farther west than a Lunenburg vessel would be fishing.

Escolar **Escolar**

Lepidocybium flavobrunneum (Smith) 1849

This species has recently been captured in our area and is thus worthy of mention. The literature of this and related species is somewhat confused and misleading. However, Bartlett and Backus[27] of Woods Hole Oceanographic Institution recently published a very useful detailed description of two specimens (and a photograph of one) caught in the Atlantic off the southern United States.



Oilfish **Rouvet**

Ruvettus pretiosus Cocco 1829

OTHER COMMON NAMES: ruvetto, scour-fish

DESCRIPTION: Body fusiform, moderately elongate, moderately compressed, greatest depth 6 in total length, caudal peduncle moderate. Head compressed, 4½ in total length, snout bluntly pointed, mouth large, oblique, lower jaw heavy, projecting slightly, angle of mouth under posterior edge of pupil, strong teeth in both jaws, some at front of mouth canine-like. Fins: dorsals (2), 1st XIII–XV, low, longest spine 9 in head, first spine over base of pectoral, fin 1¾ times as long as head, depressible in furrow, 2nd dorsal, 18, high, first ray ⅖ length of head, subsequent rays diminishing in length, base ½ length of 1st dorsal, followed by 2 small finlets; caudal large, forked; anal 17, under 2nd dorsal and similar in size and outline, followed by 2 finlets; pectorals situated low on sides behind gill opening, a little more than ½ length of head; pelvics ventral, inserted directly below base of pectorals. Skin harsh, covered with small irregular plate-like scales each armed with a spine or prickle; these prickles also on much of head. Lateral line obscure.

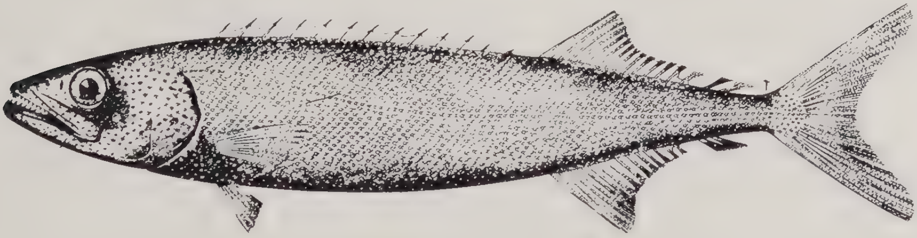
Colour, purplish-brown, darkest above, with blackish patches. Belly dull white. Bony prickles whitish. Inside of mouth dusky.

DISTINCTIONS: The oilfish is distinguished from all the mackerels by having only two dorsal and two anal finlets. Its caudal peduncle lacks any keel. The curious prickles covering the skin are unique.

SIZE: The oilfish grows to a weight of 100 pounds.

RANGE: Widely distributed in tropical seas including the Atlantic, North Pacific, and Indian oceans. Common in the West Indies, straying north to Georges

Bank and off Nova Scotia. Known at Bermuda. Present in the Mediterranean Sea; off the Canary Islands, and north to the Bay of Biscay.



Canadian distribution: Two specimens were caught on Georges Bank at approximately lat 41°40′N, long 67°44′W in 1891 and reported by Goode and Bean.[170] These measured approximately 49 and 72 inches long. A single specimen was taken by the schooner *Dot and Hellie* on September 26, 1952, off Sable Island Bank at lat 43°22′N, long 60°32′W in 300 fathoms; it is 43 inches long and is preserved in the Royal Ontario Museum (cat. no. 16725).

Family TRICHIURIDAE — Cutlassfishes or hairtails

These are pelagic fishes of moderately deep waters. In general appearance these fishes are elongate and rather strongly laterally compressed. A caudal fin may be present or absent. When the caudal is absent the body terminates in a point. Most forms have large, well-toothed mouths with beak-like premaxillaries and long, fang-like teeth; a distinct spinous dorsal fin is present; pelvic fin, if present, consists of one scale-like spine and one rudimentary soft ray. For further information see Tucker.[492]

Two species have been reported from our area.

KEY to Family TRICHIURIDAE

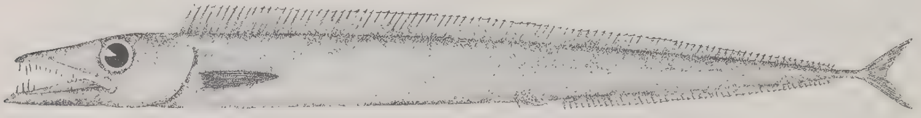
Total dorsal fin rays 91–95 (spiny rays 38–40, soft rays 53–55); spinous and soft dorsal fin bases about equal .... Black scabbardfish, *Aphanopus carbo* (p. 277)

Total dorsal fin rays 147–154 (spiny rays 45 or 46, soft rays 102–108); base of spiny dorsal fin ½ that of soft dorsal fin .... Frostfish, *Benthodesmus simonyi* (p. 278)

Black scabbardfish — **Aphanope charbon**

Aphanopus carbo Lowe 1839

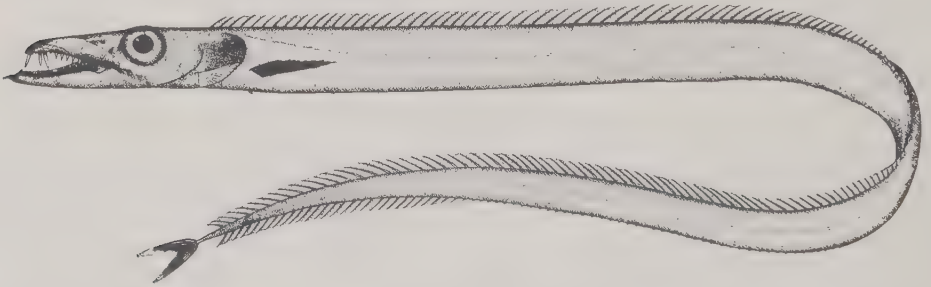
This species of trichiurid was first reported for the Atlantic waters off Canadian shores by Templeman and Squires,[481] who have provided a careful and detailed account of the specimens captured. Previous to their report the species was not known in the western Atlantic south of east Greenland. The data relating to the capture of the three specimens were as follows: a 103-cm long female, taken September 30, 1959, by otter trawl on seaward slope of the Northeast Newfoundland Shelf in 380–400 fathoms, lat 52°29′15″N and long 51°23′30″W; a 109-cm long female, taken October 5, 1959, in 380–390 fathoms, lat 50°56′30″N and long 50°31′52″W; a 110-cm long female taken mid August 1960 on a halibut longline on seaward slope of southwestern edge of Sable Island Bank in over 300 fathoms. All three specimens were uniformly black in colour when dead. The fish caught in 1959 are retained in the collections of the Biological Station, St. John's, Nfld., and the 1960 specimen is in the collections of the Royal Ontario Museum (cat. no. 22159).



Frostfish **Sabre d'argent**

Benthodesmus simonyi (Steindachner) 1891

Description: Body greatly elongate, compressed, greatest depth about 26 in total length, tapering gradually from vent to a very small caudal peduncle. Head 7½ in total length, compressed, top of head flat to concave between eyes; mouth terminal, large, lower jaw projecting and ending in a fleshy tip; 3 very long teeth on each side of upper jaw at front, a series of smaller, needle-like teeth behind these and in the lower jaw. Eye large, its diameter about 6 in head, located high on head about midway between snout and gill opening. Fins: dorsals (2) confluent, spines 45–46, soft rays 102–108, longest rays about 8½ in head, this height maintained over most of the fin, which begins over gill opening and extends almost full length of body, terminating on caudal peduncle; caudal small, deeply forked; anal one spine, 91–99 soft rays, a low fin, soft rays terminate on caudal peduncle under end of dorsal fin; pectorals small, longest rays 3 in head, base on middle of side, a short distance behind gill opening; pelvics rudimentary and scarcely visible, situated ventrally below the base of the pectorals. Lateral line begins at upper end of gill opening, thence descending to midline of sides and continuing almost to caudal peduncle. Skin naked.



Colour, uniformly silvery but with traces of dark pigment.

DISTINCTIONS: The frostfish is easily recognized by its very elongate form, projecting lower jaw and large teeth in the upper jaw.

SIZE: Up to 35½ inches in length.[170]

RANGE: Reported from moderate depths (25–208 fathoms) in the western North Atlantic Ocean from the edge of the Grand Bank to off St. Kitts in the West Indies.[170]

Canadian distribution: There are only two records. A specimen was taken from the stomach of a halibut caught in 80 fathoms on the western edge of the Grand Bank in 1887.[170] Another was caught by the S. T. *Venosta* in January 1951 on Sable Island Bank in 90 fathoms, about 120 miles ESE of Sambro Lightship (lat 44°05′N, long 60°45′W) and reported by Leim and Day.[265]

Family SCOMBRIDAE — Mackerels and tunas

The mackerels constitute a relatively large family of fishes of varying sizes, some of them, such as the tunas, weighing many hundreds of pounds. They are very similar in general shape and form, being beautifully adapted for swift movement through the water.

The mackerels all have rather terete fusiform bodies, usually with a slender and keeled caudal peduncle, caudal fin widely forked and the lobes slender. There are two dorsal fins, the first spiny, the second soft-rayed, the posterior portion broken into separate detached finlets; anal fin with one to three weak spines, the latter portion of fin divided into separate finlets like dorsal fin; scales cycloid and small.

These are wide-ranging oceanic fishes, many of them highly prized for game and commercial qualities. Nine species have been reported from our area.

KEY to Family SCOMBRIDAE

1 Dorsal fins separated by a distance greater than snout length; dorsal fin spines about 9–12 2
Dorsal fins separated by a distance less than snout length; dorsal fin spines about 13–26 4

2 Dorsal finlets 8 or 9; anal finlets 7; a median keel on each side of caudal peduncle .... Frigate mackerel, *Auxis thazard* (p. 280)
Dorsal and anal finlets (each) 5; no median keel on caudal peduncle 3

3 Dorsal fin spines 11 or 12; no air bladder .... Atlantic mackerel, *Scomber scombrus* (p. 284)
Dorsal fin spines 9 or 10; air bladder present .... Chub mackerel, *Scomber colias* (p. 283)

4 Gill rakers on lower limb of first arch 36–40 .... Skipjack tuna, *Euthynnus pelamis* (p. 281)
Gill rakers on lower limb of first arch 7–29 5

5 Dorsal fin spines 20–22; gill rakers 12–14 .... Atlantic bonito, *Sarda sarda* (p. 282)

Dorsal fin spines 13–15; gill rakers 15–28; first dorsal spine about as long as 2nd and 3rd (*Thunnus*) 6

6 Gill rakers 24–28; pectoral fin length less than $\frac{4}{5}$ head length .... Bluefin tuna, *Thunnus thynnus* (p. 290)

Gill rakers 15–22; pectoral fin length more than $\frac{4}{5}$ head length 7

7 Pectoral fin length more than $1\frac{1}{5}$ head length; extending to anal fin or beyond; trailing edge of caudal fin edged with white .... Albacore, *Thunnus alalunga* (p. 287)

Pectoral fin length less than $1\frac{1}{5}$ head length; trailing edge of caudal fin not edged with white 8

8 Anal fin elongate, more than twice length of pelvic fins; body slender, its depth more than $3\frac{3}{4}$ into its length; fins with large yellow areas; finlets lemon-yellow .... Yellowfin tuna, *Thunnus albacares* (p. 288)

Anal fin not especially elongate, not more than twice length of pelvic fins; body stout, its depth less than $3\frac{3}{4}$ into its length; no yellow patches on fins; finlets brownish-yellow .... Bigeye tuna, *Thunnus obesus* (p. 289)

Frigate mackerel — Thazard

Auxis thazard (Lacépède) 1802

DESCRIPTION: Body fusiform, robust, sides flattened, slightly compressed, tapering to a small caudal peduncle with a median keel; greatest depth 5 in total length. Head 4 in total length, snout short, conical, lower jaw projecting slightly; mouth oblique, its angle under front of pupil of eye; a single row of small, pointed teeth in each jaw. Eye 6 in head. Fins: dorsals (2), 1st X–XII, second ray longest, $2\frac{1}{4}$ in head, fin roughly triangular with posterior edge concave, originating over middle of pectoral, its base slightly exceeding its height, 2nd dorsal, 10–12, smaller than 1st dorsal, space between 1st and 2nd dorsals exceeds length of 1st dorsal, followed by 8 small finlets that fill space between 2nd dorsal and base of caudal; caudal large, broad, lunate; anal, II, 8–11, about equal to 2nd dorsal in size and originating under middle of it, followed by 7 small finlets; pectorals on mid-side, behind gill opening, triangular, less than $\frac{1}{2}$ length of head; pelvics ventral, slightly before pectorals. Lateral line somewhat undulating. Body naked except for a corselet of scales anteriorly. Corselet extends posteriorly along lateral line, tapering abruptly to a narrow band about halfway between dorsal fins; it extends as a narrow band dorsally to 2nd dorsal.[516]

Colour, dorsally deep-blue or brown, slightly paler on sides; belly silvery; sides above lateral line with irregular, oblique, black bars.

DISTINCTIONS: The frigate mackerel is distinguished from the tuna, bonitos, and Spanish mackerel *(Scomberomorus maculatus)* by the wide space between the dorsal fins; and from the Atlantic and chub mackerels by the median keel on the caudal peduncle which they lack.

SIZE: Up to a length of 14 inches.[288]

RANGE: Oceanic in the warm parts of the Atlantic and Pacific oceans. Occasionally reaching the shores of the United States in large numbers. As a stray off southern Nova Scotia and at Martha's Vineyard, Massachusetts.[288]

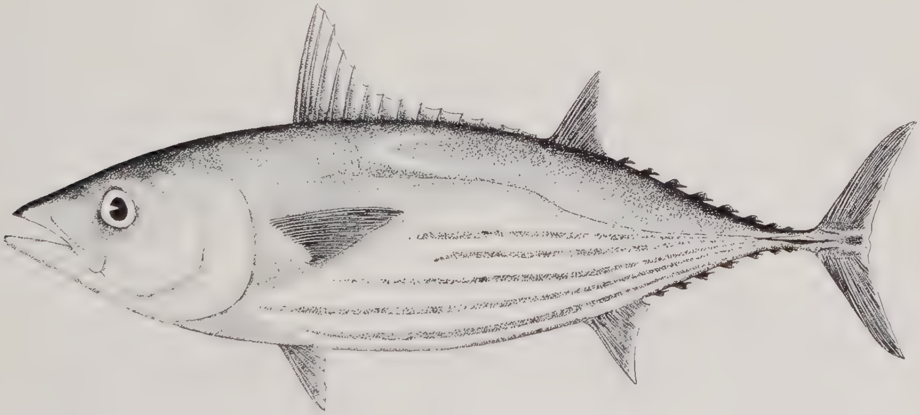
Canadian distribution: Three specimens were caught in gill nets, set by M.V. *Harengus,* in July 1955 at lat 40°58'N, long 64°06'W, and at lat 41°06'N, long 64°12'W.

Skipjack tuna **Thonine à ventre rayé**

Euthynnus pelamis (Linnaeus) 1758

OTHER COMMON NAMES: oceanic bonito, striped bonito, skipjack

DESCRIPTION: Body fusiform, stout, greatest depth 4¼ in total length, tapering rapidly behind 2nd dorsal fin to a slender caudal peduncle; peduncle with a prominent median keel on each side with 2 additional small keels near base of caudal. Head pointed, 3½ in total length; teeth on jaws but absent on vomer. Eye 6 in head, over and slightly behind angle of mouth. Fins: dorsals (2), 1st XV, first spine highest, 2¼ in head, next 5 spines decreasing rapidly in length giving fin a concave appearance, base of fin equals twice its height, originates over base of pectoral, 2nd dorsal, 12, triangular, ⅔ height of 1st dorsal, originates short distance behind 1st dorsal, followed by 8 small finlets, spaced between 2nd dorsal and base of caudal; caudal short, very broad, lunate; anal, II, 12, its origin under posterior ⅓ of 2nd dorsal, closely resembles 2nd dorsal, followed by 7 small finlets; pectorals on mid-side, behind gill opening, pointed, 2½ in head; pelvics ventral, under origin of pectorals and similar in size to them. Lateral line curving down from below middle of 1st dorsal to under middle of 2nd dorsal, thence running horizontally on mid-side. A prominent corselet of scales covers anterior part of body, ending under middle of 1st dorsal and running diagonally under pectoral fin; body otherwise scaleless.



Colour, back bluish; belly silvery; each side barred behind the corselet with

4–6 longitudinal blue to brown stripes paralleling lower contour and ending where they meet the lateral line.

DISTINCTIONS: The skipjack tuna is distinguished from the Atlantic mackerel and chub mackerel by a stouter body and by the short space between the dorsal fins. The deeply concave contour of the first dorsal separates the skipjack tuna from the Atlantic bonito, the tuna, and the Spanish mackerel, all of which have a roughly triangular first dorsal. The sharp break in the lateral line separates it from the false albacore (*Euthynnus alleteratus,* unknown in Canadian waters).

SIZE: The skipjack tuna reaches a length of 3½ feet and a weight of 50 pounds.

RANGE: The warmer parts of the Atlantic, Pacific, and Indian oceans. Rare north of Cape Cod. Caught once off southern Nova Scotia and once on southern Georges Bank.[288]

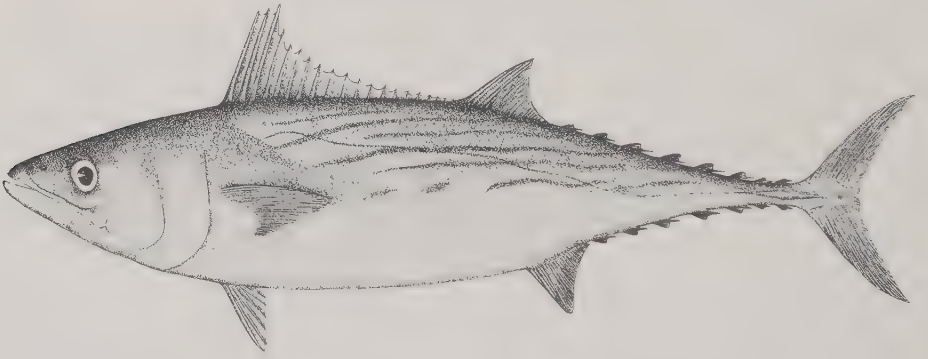
Canadian distribution: A few specimens were caught in gill nets set by M.V. *Harengus,* east of Georges Bank on July 20, 1955, at lat 41°06′N, long 64°12′W.

Atlantic bonito **Bonite à dos rayé**

Sarda sarda (Bloch) 1793

OTHER COMMON NAMES: bonito, common bonito

DESCRIPTION: Body fusiform, moderately compressed but stout, tapering to a pointed snout and to a small caudal peduncle; greatest depth 4¾ in total length; caudal peduncle with median keel and smaller ones above and below it. Head 4¼ in total length, snout pointed; angle of mouth under posterior edge of eye, teeth in both jaws, 2–4 at front of lower jaw noticeably large, no teeth on vomer. Eye 6½ in head. Fins: dorsals (2), 1st XX, roughly triangular, second ray longest, 3 in head, gradually decreasing in length posteriorly, base of fin slightly longer than head, originating over gill opening, 2nd dorsal, I, 13, less than ½ length of 1st dorsal, slightly lower, posterior edge concave, no space between it and 1st dorsal, 8 small finlets occupy the space between 2nd dorsal and base of caudal; caudal short, broad, lunate; anal I, 13, approximates size and shape of 2nd dorsal, located under middle of 2nd dorsal, followed by 7 small finlets; pectorals on mid-side, behind gill opening, triangular, length 2¼ in head; pelvics slightly smaller than pectorals, located ventrally under them. Lateral line slightly undulating. Body covered with small scales, those in pectoral region forming a corselet.



Colour, steely blue above, lower part of sides and belly silvery; seven or more dark bluish, parallel bands run obliquely forward and downward from the back, the lower ones crossing the lateral line and ending near the tip of the pectoral fin.

DISTINCTIONS: The Atlantic bonito is distinguished from the Atlantic and chub mackerels by the lack of any space between the dorsal fins; from the skipjack tuna by the shape of the first dorsal fin which is triangular and not deeply concave as in the latter; the colour pattern, consisting of stripes instead of spots, distinguishes it from the Spanish mackerel. The bonito most closely resembles the bluefin tuna; its second dorsal and anal fins are longer than high, those of the tuna are much higher than long; its mouth is longer than that of the tuna and the teeth in the jaws are larger.

SIZE: Up to a length of 3 feet and 10–12 pounds.

RANGE: The Atlantic bonito occurs in the warmer parts of the Atlantic Ocean, north to Nova Scotia and the southern Gulf of St. Lawrence. On the European side it is found north to Norway and in the Mediterranean.

Canadian distribution: The Atlantic bonito has been reported as moderately numerous on occasion near Escuminac, N.B., in the Gulf of St. Lawrence.[312] On the outer coast of Nova Scotia it has been found at the Bras d'Or Lakes,[304] at Ketch Harbour (*J. J. Cowie* records); Halifax Harbour;[232, 498] near Lunenburg, N.S.;[304] Shag Harbour, N.S.;[288] Pubnico, N.S.[498] It has only been reported once from the Bay of Fundy, where one was taken at Campobello, N.B.[395] All of these Canadian captures have been of small fish, 14 inches or less in length. All have been caught in August or September.

BIOLOGY AND ECONOMICS: Little is known of the habits of the bonito. Farther south it spawns in June. Mature specimens are not taken in the north. Food consists of mackerel, herring, alewives, menhaden, lance, silversides, and squid.

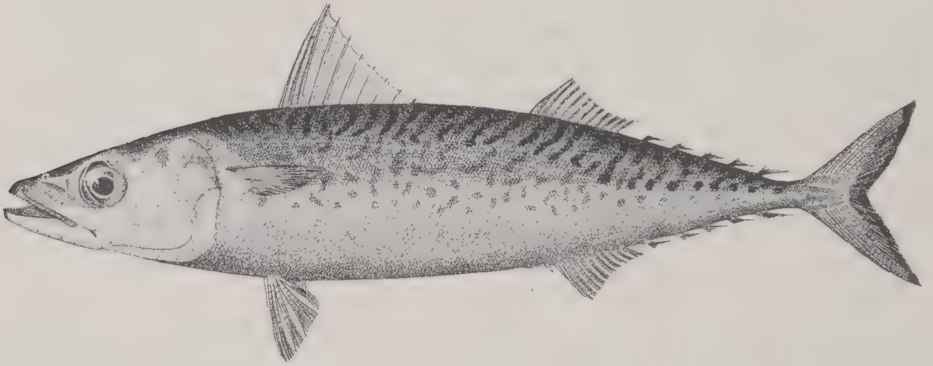
The bonito is a good food fish but is not abundant enough in Canada for commercial use.

Chub mackerel Maquereau blanc

Scomber colias Gmelin 1789

DESCRIPTION: Body fusiform, rather elongate, greatest depth 5 in total length, slightly compressed, tapering posteriorly to a small caudal peduncle with two keels on either side. Head 4⅕ in total length, snout bluntly pointed, lower jaw projecting slightly, angle of mouth under front of eye, teeth in both jaws. Eye large, 4½ in head, posterior border covered with large radiating scales. Fins: dorsals (2), 1st IX–X, spinous, height 2 in head, longer than high, triangular, no dorsal groove between fins, 2nd dorsal I, 12, lower and shorter than 1st dorsal, distance between 1st and 2nd dorsal less than length of 1st and more than length of 2nd, 2nd dorsal followed by 5 or 6 small finlets, equally spaced from 2nd dorsal to base of caudal; caudal broad, deeply forked; anal I, 11, under and similar in shape and size to 2nd dorsal, followed by 5 small finlets; pectorals 2⅓ in head, high on sides behind gill opening, lower side regularly rounded; pelvics situated on ventral edge under middle of pectorals. Scales small. Lateral line present. Air bladder well developed.

Colour, bluish on back with about 30 wavy, blackish streaks extending below lateral line, breaking into dusky spots that extend somewhat below midline of side; belly silvery with a few dusky spots. A black spot in axil of pectoral.



DISTINCTIONS: The chub mackerel has a well-developed air bladder, the Atlantic mackerel lacks this organ. Externally, the head is more pointed and the eye is larger than in the Atlantic mackerel. In the chub mackerel the space between the two dorsal fins is less than the length of the first dorsal; in the Atlantic mackerel this space markedly exceeds the length of the first dorsal. Nevertheless, the space between the dorsals is much greater than in the bonito, Spanish mackerel, and tuna.

SIZE: Up to a length of 14 inches.

RANGE: More southern than the Atlantic mackerel. Found on both sides of the North Atlantic, north to the Gulf of St. Lawrence on the west and to England on the east. Common in the Mediterranean. A closely related species occurs in the Pacific.

Canadian distribution: The chub mackerel has only been recorded a few times. It was reported as occurring irregularly at Anticosti,[405] and as occurring "everywhere" on the New Brunswick coast.[93] It was found at Herring Cove, Halifax County, N.S., in 1931 and at Hubbards Cove, St. Margaret's Bay, N.S., in 1933.[498]

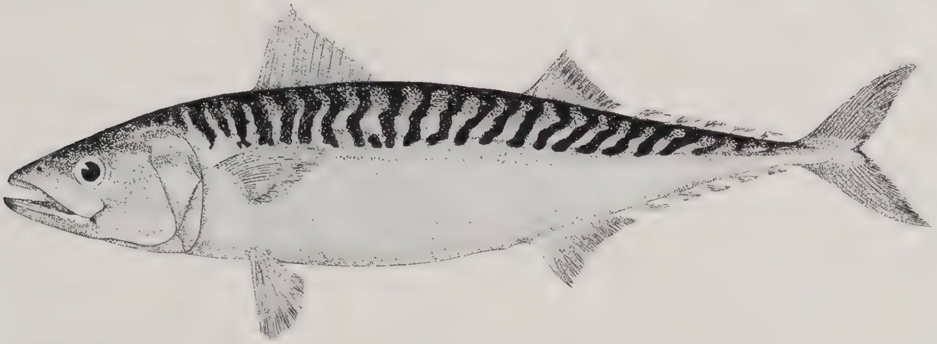
BIOLOGY AND ECONOMICS: Chub mackerel are of no economic importance in Canada. Commercial catches are sometimes made on Georges Bank.

Atlantic mackerel — Maquereau bleu

Scomber scombrus Linnaeus 1758

OTHER COMMON NAMES: common mackerel, mackerel

DESCRIPTION: Body fusiform, elongate, slightly compressed, tapering to a small caudal peduncle that bears two short keels on either side, but lacks any median keel; depth 5½ in total length at posterior end of 1st dorsal. Head 4¾ in total length, pointed, mouth terminal, angle of mouth under middle of eye; a single row of small, slender teeth in each jaw and on vomer and palatines. Eye 5 in head with two transparent masses, one in front and one behind, the so-called adipose eyelid. Fins: dorsals (2) plus small finlets, 1st, triangular, 10–14 rather weak spines that can be hidden in a mid-dorsal groove, originating over middle of pectoral fin, longest spines 2½ in head, 2nd dorsal 9–15 soft rays, about same length as 1st dorsal but only one-half as high, twice its own base length behind 1st dorsal, followed by 4–6 small finlets spaced equally in the interval between 2nd dorsal and base of caudal; caudal broad, deeply forked; anal I, 11, followed by five small finlets, similar in size to soft dorsal, under but slightly behind it, finlets similar to dorsal ones; pectorals 2 in head, high on sides, a short distance behind gill opening, posterior end somewhat concave, upper part longest; pelvics small, ventral, under origin of 1st dorsal. Scales small, skin velvet-like. Lateral line moderately prominent. Air bladder absent.

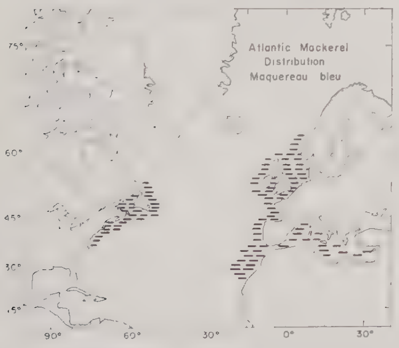


Colour, upper surface steely-dark; body barred with 20–23 dark, wavy bands, stopping above midline. Pectorals black or dusky; dorsals and caudal gray or dusky. Jaws and gill covers silvery, lower sides silvery, with iridescence; belly silvery-white.

DISTINCTIONS: The mackerel family is distinguished by the presence of a spinous and a soft dorsal fin, followed by small finlets, with similar finlets behind the anal fin. The Atlantic mackerel is distinguished from the other members of the family by having a space between the two dorsal fins greater than the length of the base of either dorsal fin.

SIZE: Up to a length of 22 inches and a weight of 4 pounds; larger ones are very rare.

RANGE: Atlantic mackerel occur on both sides of the North Atlantic Ocean, restricted to the continental shelf regions. From Triangle Harbour, Labrador, southward to Cape Hatteras off North Carolina; not abundant north of the southern Gulf of St. Lawrence or Newfoundland. From Norway to Spain in Europe. It is caught in the Mediterranean and Black Sea but not in the Sea of Azov.



Canadian distribution: Reported sparingly several times between the Strait of Belle Isle and Triangle Harbour (52°50′N) on the Labrador coast.[18, 451, 523] Some taken at Raleigh, Nfld.,[209] at Bonne Esperance, and Mekkatina;[206] at Port-au-Port Bay, Nfld., southern St. Pierre Bank;[18] Trinity Bay, Nfld.[454]

Common at Anticosti;[405] abundant seasonally in southern Gulf of St. Lawrence and at the Magdalen Islands.[92, 93, 95, 312, 334, 450]. On outer coast of Nova Scotia.[91, 446] Found sparingly in the Bay of Fundy, chiefly on the Nova Scotian side.[205] Found occasionally on Sable Island Bank in winter.

Biology and Economics: Mackerel are pelagic inhabitants of the open sea and one of the most active and migratory species. They winter in moderately deep water along the edge of the continental shelf from Sable Island Bank to off Chesapeake Bay. In the spring there is a general inshore and northeastward migration. Mackerel from as far south as New York, mingle with those from Sable Island Bank on the Canadian spawning and feeding grounds, while those from farther south tend to remain in the southern Gulf of Maine.

Mackerel tagged in Canadian waters have shown that extensive movement takes place. Fish tagged at the Magdalen Islands have been recaptured near Halifax, N.S., and on the coast of Massachusetts; others tagged at Canso, N.S., have been recaptured at Prince Edward Island in summer, on the Massachusetts coast in the autumn and on Sable Island Bank in winter. Others tagged near Yarmouth, N.S., have been recaptured off the Maine coast and in the Gulf of St. Lawrence in summer, and as far south as Delaware in the autumn.

That the mackerel avoids the colder waters is indicated by its winter withdrawal and by the following instances. They avoid the Bay of Fundy, where surface waters are cold, except in an occasional warm year; it is unusual for large mackerel to reach the New Brunswick side; half-grown fish, known as "tinkers" do appear each summer throughout the Bay but are most abundant on the Nova Scotia side. Prior to 1940 mackerel were rare in Newfoundland, but since that time, coincident with a period of warmer water in the north, substantial catches have been made along the lower east coast.[474]

Mackerel spawn in May, June, and early July in Canadian waters. Some spawning occurs in April near Chesapeake Capes. While some eggs have been taken in tows along the coast of Maine, in the southern Bay of Fundy, and on the outer coast of Nova Scotia,[446] the most extensive spawning takes place on either side of this area. The most important spawning ground is from Chesapeake Capes to Massachusetts Bay; and the second most important area is the southern Gulf of St. Lawrence.[429]

Average-sized female mackerel produce up to half a million eggs. The eggs vary somewhat in size, averaging 1.0–1.2 mm in diameter; each has a single small oil globule, and the eggs float in the upper layers of water down to a depth of about 10 fathoms. The hatching period is short, 2 days at 70 F and 9 days at 50 F.[536] There is evidence that mackerel eggs hatch normally at temperatures down to 46 F.[429]

Atlantic mackerel larvae have been found in moderate numbers in the Gulf of St. Lawrence.[102] Tows along the Nova Scotia coast in 1922 did not take any,[446] but subsequent samplings in 1954 and 1955 picked some up on Browns Bank, Sable Island Bank, Banquereau, and inshore off eastern Nova Scotia.

The early growth of mackerel is rapid. Two months after hatching they average 2 inches in length; yearlings are 10–11 inches long. Subsequent growth is slower; fish 6 years old average 16 inches in length and those 8 years old are just under 18 inches in length.[49]

Mackerel eat planktonic animals almost exclusively. Their diet includes *Calanus*, pelagic amphipods, euphasiids, *Sagitta* sp., crab larvae, annelid worms, small squid, fish eggs, and fish fry such as herring, silversides, and sand lance.

The mackerel is an important food fish and is used fresh, frozen, and salted. It is also used for bait. It is caught in gill nets, traps, purse seines, and by "jigging."

The mackerel fishery has been subject to great fluctuations. In 1884 the catch in the United States and Canada reached a high point of 233 million pounds. In contrast in 1910 the total catch was down to 12½ million pounds. Since 1910 there has been improvement but the catch varies greatly from year to year. The maximum and minimum catches in Canada were 70 million pounds in 1880 and 7 million pounds in 1910.[431]

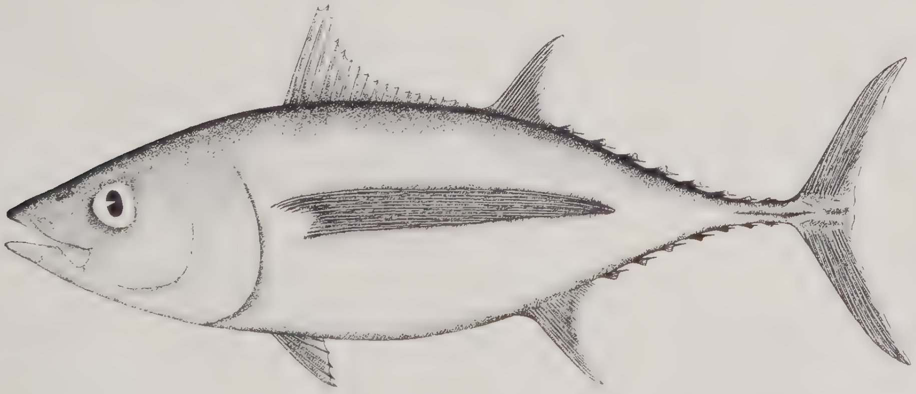
The catch of mackerel from the Canadian Atlantic area for 1962 was 16,146,000 pounds with a value of $651,000.[70b]

Albacore — Germon atlantique

Thunnus alalunga (Bonnaterre) 1788

OTHER COMMON NAMES: long-finned albacore, long-finned tuna

DESCRIPTION: Body fusiform, moderately elongate but stout, slightly compressed, greatest depth 4 in total length; caudal peduncle slender, with a strong keel on either side. Head 3¾ in total length, conical, mouth terminal, oblique, its angle under front of eye; teeth in jaws. Eye 5 in head. Fins: dorsals (2) 1st XIII–XIV, first rays longest, 3 in head, gradually shorter to end of fin, base slightly less than length of head, fin originates above base of pectoral, 2nd dorsal II, 12–14, higher than long, height of first rays about equal to longest spines of 1st dorsal, no interspace between dorsal fins, 7 or 8 finlets between 2nd dorsal and caudal; caudal broad, lunate; anal II, 12–13, much like 2nd dorsal and originating under middle



of it, followed by 8–10 finlets; pectorals inserted on mid-side a short distance behind gill opening, very long and comparatively narrow, ending under first to third dorsal finlets, i.e. 1½–2 times length of head; pelvics small, ventral, under but slightly in advance of base of pectorals. Scales medium, covering body, corselet indistinct. Lateral line present.

Colour, metallic steel-blue above and on sides; belly silvery; fins dark with metallic lustre.

DISTINCTIONS: The albacore tuna may be recognized as a mackerel-like fish by its spinous and soft dorsal fins, followed by several finlets. The adult is distinguished from the bluefin tuna and all other scombroids by its very long pectoral fins that reach beyond the second dorsal fin; the pectoral fin of the bluefin tuna does not reach the end of the spinous dorsal fin, but terminates below 8th to 10th dorsal spine.

SIZE: Up to a length of 3½ feet and a weight of about 75–80 pounds.

RANGE: Although a fish of warm tropical or subtropical waters, recent investigations indicate that the albacore is widely but sparsely distributed on the Atlantic coast, south of the Canadian area. Occurs widely through the tropical Atlantic and in the Mediterranean.

Canadian distribution: Only two records are known and the first is questionable. One specimen was taken on a trawl on Banquereau in the summer of 1878 at a depth of 300 fathoms.[168] Another specimen 48½ inches long was caught on halibut trawl near Devil's Island, Halifax Country, N.S., in September 1922. It is in the Nova Scotian Museum of Science, Halifax, N.S.[498]

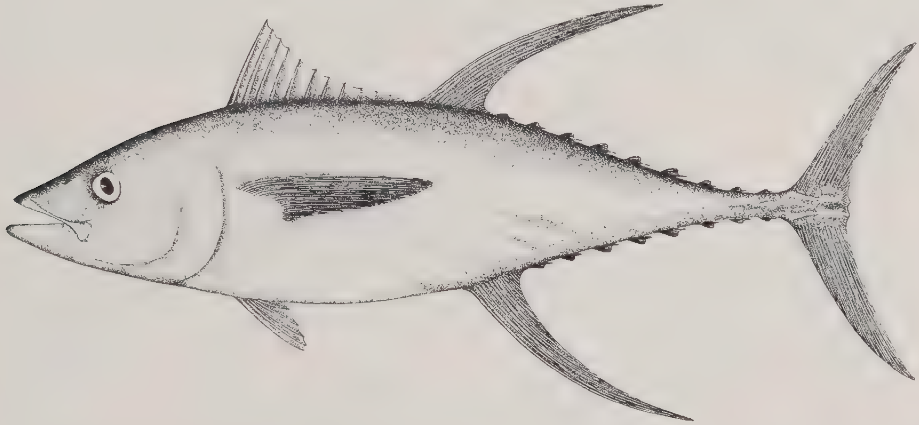
Yellowfin tuna **Albacore à nageoires jaunes**

Thunnus albacares (Bonnaterre) 1788

OTHER COMMON NAMES: yellowfin, Allison's tuna, autumn albacore

DESCRIPTION: Body elongate, fusiform, greatest depth 4½ in total length, occurring at middle of 1st dorsal; from this point rearward the depth decreases regularly to a small caudal peduncle with prominent keels on its sides. Head 4½ in total length, somewhat compressed, pointed, mouth terminal, angle slightly in front of eye, lower jaw protruding. Eye 7–8 in head. Fins: dorsals (2) 1st XIII–XIV, first spine longest 2 in head, fourth spine 4 in head and subsequent ones gradually shorter, base of fin slightly shorter than head length, fin originates about ⅙ of length of head behind gill opening, 2nd dorsal 12, variable in height with age but may be scythe-shaped with longest rays more than head length, base 2½ in head, a short space between the 2 dorsal fins, 2nd dorsal followed by 8–9 small finlets equally spaced between 2nd dorsal and caudal; caudal large, lunate, tips of lobes widely spread—the distance between them 1½ times length of head; anal II–III, 12, variable with age, scythe-shaped, slightly larger than 2nd dorsal, its origin under middle of 2nd dorsal, followed by 8–9 finlets, evenly distributed between anal and caudal; pectorals long, pointed, ⅘ length of head, base on middle of side directly under origin of 1st dorsal; pelvics shorter, on ventral part of body, base slightly anterior to that of pectoral. Lateral line not prominent. Small scales cover body.

Colour, opaque Prussian-blue above the level of the lateral line, becoming lighter below, the sides of the head and the whole ventral region metallic white, pale carmine with greenish tones in region of anal fin; second dorsal and anal deep yellow, paler toward extremities; finlets brilliant yellow, bordered with black; tips of caudal yellowish. Young individuals have a series of silvery spots on the sides.[143]



Distinctions: The yellowfin tuna is somewhat more slender than the bluefin. The long scythe-shaped second dorsal and anal fins are useful characters in large specimens. The yellowish colour of the second dorsal, anal and caudal in the yellowfin contrast with the darker colours in the bigeye. The eye of the yellowfin is somewhat smaller.

Size: Up to a length of 6 feet and 300 pounds in Atlantic.

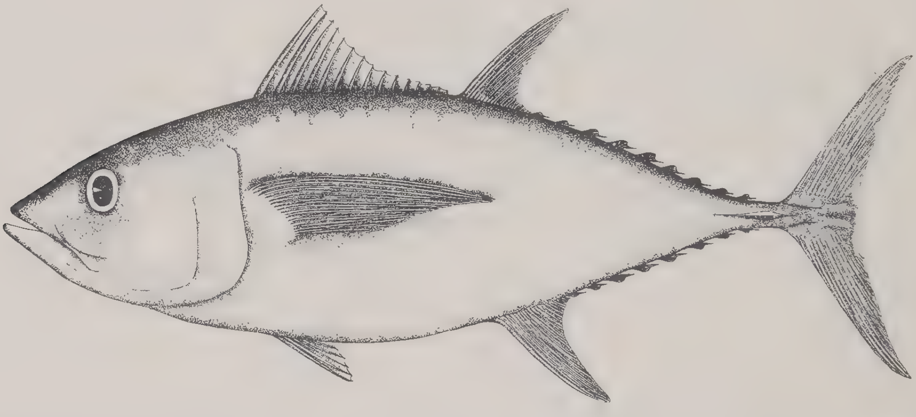
Range: Circumtropical, occurring on both sides of the Atlantic Ocean and in the Pacific Ocean. Along the edge of the continental shelf and offshore from Nova Scotia to Maryland and south.[288] Off Portugal, the Azores, Madeira, Canary Islands, Saint Helena, Angola,[143] Algoa Bay, and Durban, Africa.[434]

Canadian distribution: Three yellowfin tuna were caught by the M.V. *Delaware* at a station 95 miles southeast of Cape Sable, Nova Scotia (lat 42°18′N, long 64°02′W), on September 11, 1957.

Bigeye tuna — Thon ventru

Thunnus obesus (Lowe) 1839

Description: Body elongate fusiform, greatest depth about 4 in total length, occurring under fifth spine of 1st dorsal, depth largely maintained as far back as origin of 2nd dorsal, posterior to which the depth decreases rapidly to a narrow caudal peduncle; a median keel on each side of caudal peduncle. Head 4 in total length, slightly compressed, pointed, mouth terminal, angle considerably in advance of eye, lower jaw projecting; eye large, 6–7 in head. Fins: dorsals (2) 1st XIII, first rays about 2½ in head, subsequent ones gradually shorter, base of fin 1⅓ in length of head, fin originates a short distance behind a perpendicular through the gill opening, 2nd dorsal 13, first rays about 2 in head, subsequent ones rapidly shorter, base of fin about 3 in head, a short space between the 2 fins, 9 finlets evenly spaced between 2nd dorsal and caudal; caudal large, lunate, lobes diverging widely, their tips about 1½ times head length apart; anal slightly higher than 2nd dorsal, base 5 in head, its origin under posterior edge of 2nd dorsal, 8–9 finlets evenly spaced between anal and caudal fins; pectorals long, pointed, slightly shorter than head, tip reaches a perpendicular through origin of 2nd dorsal, base on middle of side under origin of 1st dorsal; pelvic fins shorter, located ventrally under base of pectorals. Lateral line indistinct. Body covered with small scales.



Colour, dark ashy-blue above a line from the snout to the keels on the caudal peduncle, changing below this line to a leaden blue. Caudal and pectoral fins and caudal peduncle a reddish black; first dorsal slightly yellowish; finlets yellow, edged with black.[143]

Distinctions: The second dorsal and anal fins are blackish and lack any yellow tinge, whereas both of these fins are a deep yellow in the yellowfin. The eye of the bigeye is larger than that of the bluefin and yellowfin (see Key, p. 280).

Size: Up to a length of 6 feet and 400 pounds.

Range: On both sides of the Atlantic Ocean and perhaps across it. Frequent in the Caribbean Sea from Venezuela to Florida; occasional from Florida to off southern Nova Scotia; at Bermuda.[289] Reported in the eastern Atlantic from Madiera, the Azores, Canary Islands, Saint Helena, and Angola.[143] Also in the Pacific Ocean.[141]

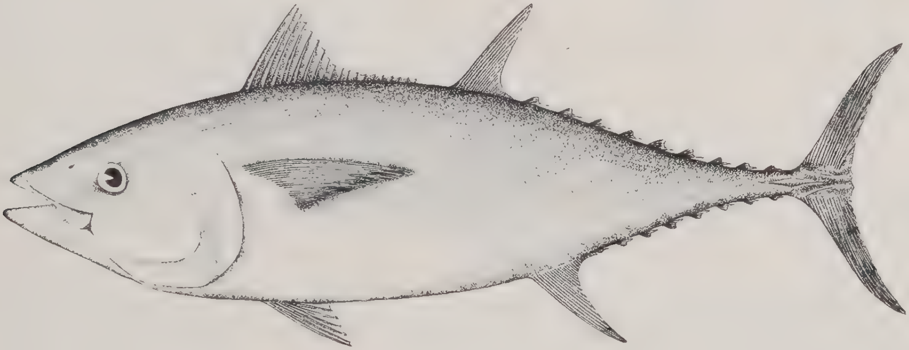
Canadian distribution: One specimen 49 inches long was caught by the M.V. *Delaware* 95 miles southeast of Cape Sable, Nova Scotia (lat 42°18′N, long 64°02′W), on September 10, 1957,[289] and there have been additional captures more recently.

Bluefin tuna **Thon rouge**

Thunnus thynnus (Linnaeus) 1758

Other common names: tunny, horse mackerel, albacore, tuna, bluefin

Description: Body fusiform, stout, little compressed, greatest depth under middle of 1st dorsal 4¼ in total length, caudal peduncle small with a strong median keel, and smaller keels above and below its posterior end. Head conical, 4 in total length, mouth terminal, lower jaw projecting slightly, angle of mouth under front of eye; one series of small, conical teeth in each jaw. Eye small, 8 in head. Fins: dorsals (2), 1st XIV, first 2 spines longest, 2½ in head, decreasing gradually in length to very short final ones, length of fin 1⅕ in head, originating over front of pectoral, can be depressed in groove in back, 2nd dorsal I, 13, slightly higher than 1st dorsal, base ½ height, posterior edge concave, interspace between dorsals very short, 2nd dorsal followed by 9 finlets, distributed between it and the caudal peduncle; caudal large, broad, lunate; anal I, 12, same shape and size as 2nd dorsal, its origin under 1st dorsal finlet, followed by 8 or 9 finlets; pectorals on mid-side, origin somewhat behind gill opening, lower side concave, length 1⅔ in head; pelvics ventral, under origin of pectorals, posterior edge truncate. Scales cover body, those in pectoral region forming an obscure corselet. Lateral line present.

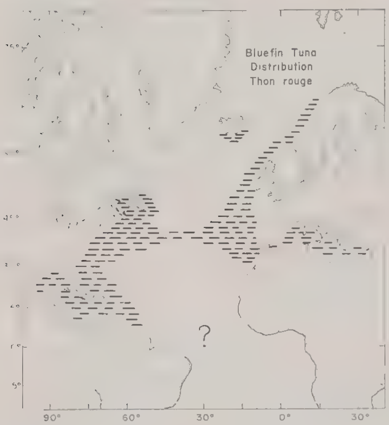


Colour, dark blue above, grayish with silvery spots below; cheeks silvery; dorsal fins dusky, anal fin silvery-gray; dorsal and anal finlets tinged with yellow.

Distinctions: Usually the bluefin tuna is distinguished from other members of the mackerel family by its large size and short pectoral fins. Small ones are readily distinguished from the Atlantic and chub mackerel by the closely placed first and second dorsal fins; it differs from the skipjack tuna in having its first dorsal only slightly concave on its upper margin; the second dorsal fin being higher than long differentiates it from the Atlantic bonito and the Spanish mackerel.

Size: Tuna reach a large size, up to 14 feet long and weighing 2000 pounds or more. One weighing 1148 pounds was harpooned near Wedgeport, Nova Scotia, in the early 1930s. Specimens weighing between 400 and 600 pounds are angled frequently in that locality. The world record bluefin tuna taken by rod and line was caught at St. Ann Bay, N.S., and weighed 977 pounds.

Range: The bluefin is a fish of the warmer waters of the Atlantic Ocean. It ranges from Notre Dame Bay in Newfoundland (rarely to southern Labrador), southward to the West Indies. It occurs at Iceland and its range extends from northern Norway to the Mediterranean Sea. It is occasionally caught in the North Sea in autumn and in the vicinity of the islands on the north and west coasts of Scotland.



Canadian distribution: The most northerly record is from Hamilton Inlet, Labrador.[25] It is reported more frequently from Dildo, Trinity Bay, Nfld.; also taken off the east coast of the Avalon Peninsula.[17] It occurs sparingly in the Gulf of St. Lawrence at Anticosti;[405] Bonne Bay, Nfld.;[49] at Gaspé and Chaleur Bay;[93, 450] in the outer estuary of the Miramichi;[312] and at Malpeque Bay, P.E.I.;[450] Reported from Cape Breton and at Canso, N.S.;[91] it occurs more frequently in St. Margaret's Bay, N.S., and along the shores from Liverpool to Yarmouth, N.S. Occasionally in the Bay of Fundy, usually on the Nova Scotian side; infrequently in Passamaquoddy Bay;[205] found at Grand Manan.[398]

Biology and Economics: Bluefin tuna are summer visitors in Canadian waters. Like other members of the family they travel in schools near the surface, frequently jumping clear of the water. They are one of the very few fishes with a body temperature distinctly higher (up to 20 F degrees) than that of the surrounding water, a condition related to its activity.[69, 106]

No tuna under 12 pounds in weight has been caught in Canadian waters and fish under 20 pounds are uncommon.

The eggs are small, .05–.04 inch in diameter, buoyant and with an oil globule.[49] Recently both ripe and spent tuna, presumed tuna eggs, and young larvae have been found in the Straits of Florida during May and early June,[385] but no tuna containing spawn have been reported in Canadian waters.

The tuna grows to a weight of 22 pounds in its third year and to 120 pounds in about 6 years; a 623-pound specimen was judged to be 18 years old.[108]

Tuna eat small fishes, such as herring, mackerel, and silver hake; also squid and euphausiids. Occasionally a large fish such as a redfish or dogfish has been found in the stomach of a tuna.

Tuna movements are sometimes sporadic and although the International Tuna Cup Matches were held off Wedgeport, N.S., until 1958, in later years the large tuna seem to have moved to other areas. However, in 1965 the International Match was again held successfully off Wedgeport.

Commercially tuna are caught in traps, longlines, on floating trawls, purse seines, and by harpoon. The flesh is eaten fresh or canned. In 1953 the Nova Scotian catch was 379,000 pounds, and in some years this quantity has doubled.

The catch of tuna (mixed) from the Canadian Atlantic area for 1962 was 243,000 pounds with a value of $22,000.[70b]

Family ISTIOPHORIDAE Spearfishes and sailfishes or marlins

This is a small family of large fishes best known for the sword-like snout and large dorsal fin. The various species have scales, long pelvic fins, and teeth which persist throughout life. The spearfishes are important both commercially and as game fishes, but not in Canadian waters. The body form of the young differs considerably to that of the adult making identification difficult. The various species occurring in the western Atlantic are better understood now than heretofore, as a result of the work of de Sylva,[115, 116] de Sylva and Davis,[117] and Robins and de Sylva.[386]

Only two species have been reported to occur in our area.

KEY to Families XIPHIIDAE and ISTIOPHORIDAE*

1 Pelvic fins absent; scales absent; sword stout and always flattened dorso-ventrally (Xiphiidae) .... Swordfish, *Xiphias gladius* (p. 295)

Pelvic fins present; scales present, elongate; sword slender, cyclindrical or somewhat laterally compressed (Istiophoridae) 2

2 Anterior part of spinous dorsal fin rounded and higher than body depth at dorsal fin origin; flesh red; size usually small, less than 300 pounds .... White marlin, *Makaira albida*** (p. 293)

Anterior part of spinous dorsal fin pointed and low, its height less than body depth at dorsal fin origin; flesh pale; size larger, to 2000 pounds .... Blue marlin, *Makaira nigricans* (p. 294)

White marlin **Makaire blanc**

Makaira albida (Poey) 1860

DESCRIPTION: Body much compressed, greatest depth 7½ in total length, at level of origin of pectoral fin, tapering gradually to a stout caudal peduncle; 2 short, horizontal keels on base of tail. Head small, 3⅓ in total length (sword included in both measurements); mouth terminal, but upper jaw prolonged into a short sword that is slender and rounded, its projection beyond lower jaw a little less than greatest depth of fish; mouth large, extending well behind eye; small teeth in jaws; upper profile of head concave. Eye 18 in total length of head. Fins: dorsals (2), 1st 47–48 stiff spines, originating above gill opening, its base 3 times greatest depth of fish, first part of fin high, ⅔ greatest depth of body, rapidly falling off to shorter rays, tip of high portion rounded, 2nd dorsal 6, low and short, situated midway between end of 1st dorsal and caudal; caudal lunate, broad, distance between tips of lobes twice greatest depth of body; anals (2), 1st II, 12 or 13, lower than dorsal height, located under posterior part of 1st dorsal, 2nd anal 6, similar to 2nd dorsal but situated slightly in front of it; pectorals low on sides behind gill openings, a trifle longer than greatest depth of body; pelvics very slender, slightly shorter than pectorals, located ventrally below base of pectoral, consisting of 5 spines fused together. Body covered with embedded scales.

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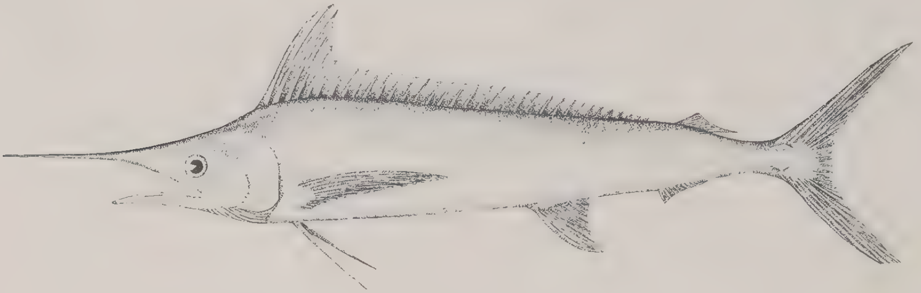
* Although the sailfish, *Istiophorus albicans*, has not been reported, it may be recognized by the large, spiny dorsal fin, in which the central spines are distinctly longer than the anterior ones.

** Also called *Tetrapturus albidus* Poey.



Colour, dark-blue above, whitish below; fins dark blue.

Distinctions: The white marlin is distinguished from the swordfish by its relatively short sword, which is rounded, rather than flattened. It possesses pelvic fins which the swordfish lacks. It is distinguished from the blue marlin by the rounded apex of the first dorsal fin; that of the blue marlin is pointed.

Size: The white marlin has been reported to attain weights up to 300 pounds.

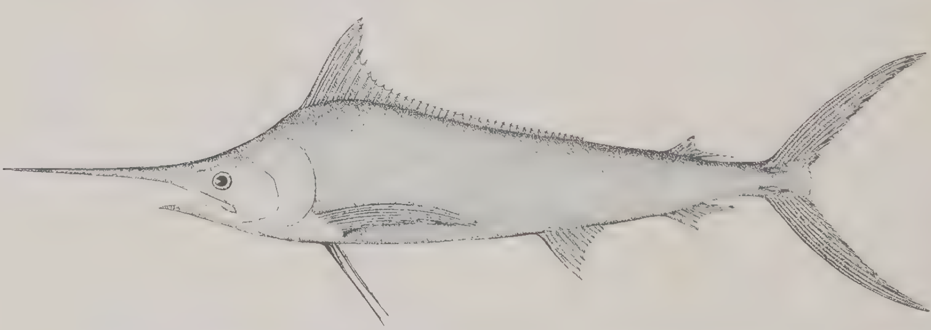
Range: Western North Atlantic Ocean. Common in waters off Cuba, the Bahamas, and Bermuda; abundant in summer off Delaware Bay, straying to Georges Bank, the Gulf of Maine, and off Nova Scotia.

Canadian distribution: Bigelow and Schroeder[49] report a probable white marlin, a 5-foot specimen weighing 21 pounds caught August 18, 1931, on Sable Island Bank; one was harpooned near Glace Bay, N.S., in 1945, and several were seen off Halifax, N.S., according to Farrington.[134] There are no specimens to substantiate any of these records.

Blue marlin **Makaire bleu**

Makaira nigricans Lacépède 1803

The blue marlin has been reported to occur in our area on at least two occasions. A small specimen of 6 feet 10 inches in length was harpooned on the



southern part of Browns Bank on September 5, 1930, and another was caught in the same region in July 1931. Bigelow and Schroeder[49] record both these records and note that the first specimen is in the collection of the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts.

Family XIPHIIDAE Swordfish

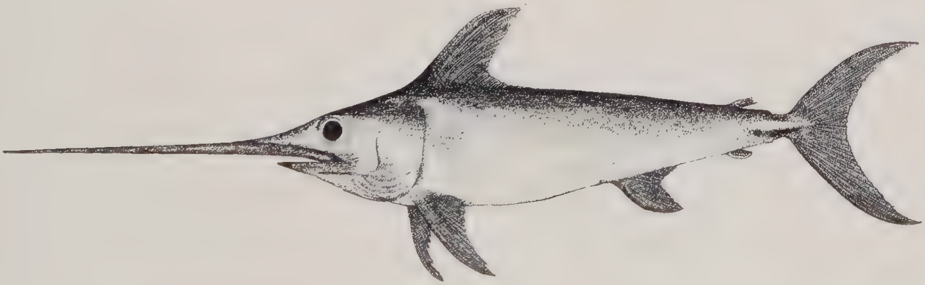
The family Xiphiidae contains only a single genus and species, the swordfish *Xiphias gladius*. This scientific name refers to the sword-like projection of the upper jaw. This formidable weapon has been known and described since the time of Aristotle, who called the fish *Xiphias* meaning "sword," and in Latin it was called *gladius* also meaning "sword," and thus Linnaeus wrote the name *Xiphias gladius*.

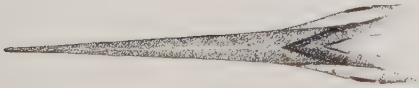
Swordfish Espadon

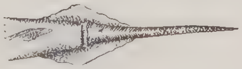
Xiphias gladius Linnaeus 1758

OTHER COMMON NAMES: broadbill

DESCRIPTION: Body stout, greatest depth just behind head, being 8 in total length (including sword); very slightly compressed; caudal peduncle moderate with strong lateral keel. Head 2¼ in total length (sword included in both measurements); mouth large, terminal except that upper jaw is greatly prolonged into a flat sword that is wider than deep, sword projects beyond lower jaw 1¾ times length of head (to tip of lower jaw); angle of mouth behind posterior part of eye; teeth in jaws only while young; lower jaw pointed; upper profile of head slightly concave. Eye 11 in head, measured to tip of lower jaw. Fins: dorsals (2), 1st 39–40, higher than long, rear margin deeply concave, height 1¼ times maximum body depth, origin slightly in front of gill opening, 2nd dorsal 4, very small, on caudal peduncle; caudal lunate, very broad, distance between lobe tips 2½ times greatest depth of body; anals (2), 1st 14, smaller than 1st dorsal, but somewhat similar in shape, located well back on ventral surface, 2nd 14, only a trifle larger than 2nd dorsal, located slightly before it; pectoral scythe-shaped, length







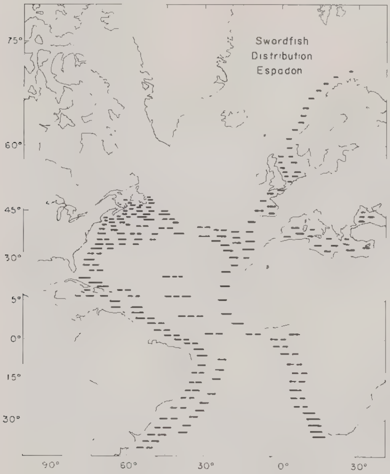
equalling height of 1st dorsal, located low on body, behind gill opening; pelvics absent. Some rudimentary scales while young, skin naked later.

Colour, dark metallic-purplish above, dusky below; sword almost black above, lighter on under side; fins dark with silvery sheen.

Distinctions: The swordfish is distinguished from all other northern fishes by its broad sword; its lack of pelvic fins and its naked skin should also be noted.

Size: Swordfish may attain large sizes. The dressed weight of the largest fish caught in Canadian waters was reported to be 915 pounds.[487] A specimen weighing 1182 pounds was caught off the coast of Chile in 1953 on rod and line and reported as a world record.[487]

Range: Both sides of the Atlantic Ocean. On the North American side from Bonne Bay, Nfld., the Grand Bank, and Cape Breton Island and along the outer shores of Nova Scotia, southward to Argentina (S lat 35°). On the European coast, in varying degrees of abundance, from the vicinity of Cape Town, South Africa, northward to the Mediterranean; in the Black, Red, Baltic, and North seas, northward as far as Finmark on the northern coast of Norway.[487]



Canadian distribution: The most northerly record appears to be for Bonne Bay, Nfld.; they range from Port-aux-Basques to Hermitage Bay, Nfld.[537] In the Gulf of St. Lawrence they are reported from the Miramichi Bay.[312] More abundant off eastern Cape Breton[95] and at Canso, N.S.[91] They are caught along the Nova Scotia coast generally from Yarmouth to Scatari Island; on Banquereau,[17] and on St. Pierre and Grand banks. Rarely, if ever, seen in the Bay of Fundy.[205]

Biology and Economics: The swordfish is an oceanic traveller swimming usually near the surface in water having a temperature of at least 60 F; occasionally it is found in slightly colder areas (down to 50 F). It occurs in Canadian waters therefore in summer and early fall, the chief catches being made in August and September.[71] It comes very close to shore at times, probably in pursuit of food.

Swordfish eat such fishes as herring, mackerel, butterfish, silver hake, rat-tails, and squid. Farther south menhaden and bluefish are eaten as well.

No swordfish with ripe reproductive organs has ever been caught off the Canadian coast. The eggs are not known anywhere, but small swordfish and larvae have been found in warmer waters between lat 20° and 39°.[49]

Harpooned fish sometimes drive their swords through dories and small boats, and at times even larger vessels are attacked. There are numerous stories of such attacks in the literature.

Remoras and lampreys frequently attach themselves to swordfish. A myxosporidian organism causes some economic loss by producing "jellied" swordfish, when large areas of flesh become soft and gelatinous.[323]

Swordfish are usually harpooned. Their habit of swimming on the surface with the dorsal and caudal fins showing allows fishermen to sight them and approach within striking distance in boats equipped with a projecting "swordfish stand" on the bow. The fish is struck with the harpoon, the barb detaches, and a line and buoy go overboard. The fish is secured by a doryman and picked up by the vessel. Some swordfish are caught in tuna-mackerel traps in St. Margaret's Bay, N.S. They are sometimes angled for by sports fishermen but not to the same extent as tuna. Since 1963, longlines have been used successfully for catching swordfish and have proved to be more effective than harpooning.

Swordfish flesh is highly prized, the chief market being the United States. They are eaten fresh or frozen for storage.

The catch of swordfish from the Canadian Atlantic area for 1962 was 3,461,000 pounds with a value of $1,570,000.[70b] The fluctuations in the commercial catch are reflected in the following statistics for the Canadian Atlantic area, expressed in millions of pounds: 1959, 6.7; 1960, 3.9; 1961, 3.2; 1962, 3.5; and the preliminary estimate for 1963 is 12.2.

For further information see "The Swordfish (*Xiphias gladius* L.), its life history and economic importance in the northwest Atlantic." Bulletin No. 130, Fisheries Research Board of Canada.[487]

Suborder BLENNIOIDEA—Blenny-like fishes

These fishes are elongate, sometimes laterally compressed, sometimes slender and eel-like, with moderate mouths containing slender teeth except in the genus *Anarhichas* (large fishes with enlarged coniform teeth and stout molars). The spiny dorsal fin is long and the basal segment of dorsal and anal fins attached to a neural or haemal spine, the dorsal and anal spines thus corresponding to the number of vertebrae; pelvics jugular when present and reduced in number.

Four families are represented in our area.

KEY to Suborder BLENNIOIDEA (excluding Zoarcidae)

1 Pelvic fins absent 2

Pelvic fins present 3

2 Dorsal fin inserted behind head; dorsal, caudal, and anal fins confluent or nearly so; mouth at oblique angle .... Wrymouth, *Cryptacanthodes maculatus* (p. 307)

Dorsal fin inserted over opercles; caudal fin distinct and separate; mouth nearly horizontal; incisor teeth prominent .. Wolffishes, family Anarhichadidae (p. 298)

3 Pelvic fins usually well developed but of few rays and located in advance of pectoral fins .... Pricklebacks, family Stichaeidae (p. 305)

Pelvic fins much reduced in size, of one spine and one soft ray only, located under or behind pectoral fins .... Gunnels, family Pholidae (p. 302)

Family ANARHICHADIDAE Wolffishes

The wolffishes are larger than any other blenny-like fishes occurring in our area, attaining weights of 40 pounds or more. Their mouths are remarkably well-equipped with coniform and crushing teeth, an adaptation to bottom feeding with emphasis on molluscs. They are strongly compressed laterally having long dorsal fins composed of spiny rays, distinct but small caudal fins but no pelvics.

Three species of wolffishes occur in our area contributing a substantial poundage to commercial catch.

KEY to Family ANARHICHADIDAE

1 Backward extension of vomerine teeth extending beyond palatine teeth, the vomerines noticeably larger than palatines; body distinctly barred especially anteriorly; (the more common species) .... Atlantic wolffish, *Anarhichas lupus* (p. 299)

Backward extension of vomerine teeth not obviously extending beyond palatine teeth; body conspicuously spotted or blotchy but not distinctly barred 2

2 Body and head with distinct black spots; backward extension of palatine teeth beyond rear margin of vomerine teeth .... Spotted wolffish, *Anarhichas minor* (p. 301)

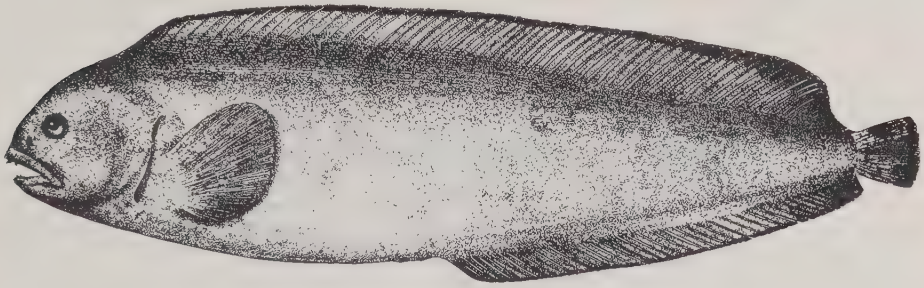
Body and head without distinct spotting, but sometimes with darker blotches; backward extension of vomerine and palatine teeth about equal .... Northern wolffish, *Anarhichas denticulatus* (p. 298)

Northern wolffish Loup à tête large

Anarhichas denticulatus Krøyer 1884

Other common names: bull-headed catfish, broad-headed catfish, arctic wolffish, poisson-loup

Description: Body heavy, thick set, greatest depth 4 in total length occurring at middle of pectoral fin, thence the body curves to a small caudal peduncle. Head 5¼ in total length, heavy, broad, pointed, upper and lower profiles slightly convex; mouth terminal, slightly oblique, angle under posterior edge of eye, moderate canine teeth in front of jaws, row of vomerine teeth shorter than rows of palatine teeth and not extending as far back in mouth. Eye small, 7 in head. Fins: dorsal (1) LXXVII–LXXIX, spines about 3 in head, first and last 3 or 4 spines shorter, fin originates over posterior edge of head and extends to base of caudal, fin very thick at its base; caudal fin small, slightly rounded; anal 45–47, rays 4 in head except the first few which are shorter, fin ½ length of dorsal but ending under posterior end of dorsal on caudal peduncle; pectorals rounded, rays 2 in head, base low on sides, a short distance behind gill opening; pelvics absent. Lateral line with 2 branches, widely separated, on anterior half of body only. Body with poorly developed scales.



Colour, deep brown with numerous indistinct dark spots; belly similar to rest of body.

Distinctions: The northern wolffish is much stouter and deeper than the other two species; the head is more pointed; the canine teeth are smaller and the palatine teeth end beyond the vomerines; in the other wolffishes the row of vomerine teeth equals or is longer than the palatine rows. Its colouration is also different as it lacks the vertical bars of the Atlantic wolffish or the pronounced spots of the spotted wolffish.

Size: Up to a length of 56½ inches and a weight of 43 pounds.[306]

Range: Arctic seas and south to Sable Island Bank. Found at Greenland, Iceland, the Faroes, Finmarken, the Murman coast, and Novaya Zemblya.

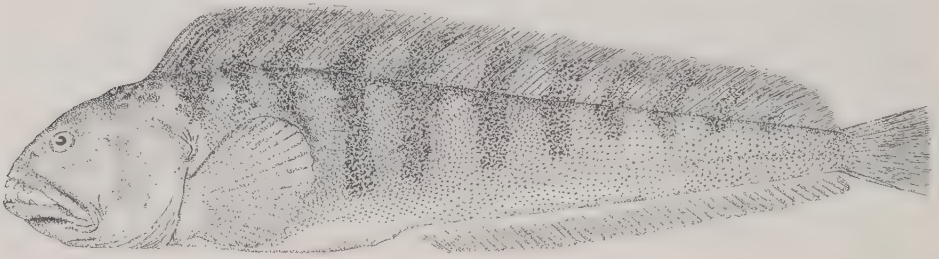
Canadian distribution: The northern wolffish is reported from Mould Bay, Prince Patrick Island, N.W.T.[517] Strangely enough there are no records between there and the Grand Bank, where one was captured at lat 44°30′N, long 53°30′W, in March 1940;[306] and another was reported much earlier at the southern tip of the same bank at lat 42°55½′N, long 50°51′W.[170] It was recorded from Banquereau many years ago[35] and four specimens were reported from the bank or the gully to the north of it in 1937.[306] Two specimens were caught on Sable Island Bank in May and December 1934 at or near lat 44°00′N, long 59°05′W.[45] One was reported from 50 fathoms off Canso, N.S.[91]

Atlantic wolffish **Loup atlantique**

Anarhichas lupus Linnaeus 1758

Other common names: catfish, striped wolffish, poisson-loup

Description: Body compressed and elongate, greatest depth 5½ in total length, occurring about middle of pectoral fin, body tapering thence to a small caudal peduncle. Head 5 in total length, heavy, blunt, profile rounded; mouth terminal, oblique, angle somewhat behind posterior edge of eye, a row of about 6 large, stout, conical teeth at front of upper jaw with a group of 5 or 6 smaller canine teeth behind them, these opposed by 4–6 large tusks at the front of the lower jaw, 3 series of crushing teeth in roof of mouth, the central ones united in a solid plate, 2 rows of rounded molars in lower jaws, small scattered teeth in throat. Eye small, 7½ in head. Fins: dorsal (1) LXIX–LXXVII, spines uniformly a little more than ½ length of head, flexible near their tips, fin begins over posterior part of head and extends to base of caudal; caudal small, very slightly rounded; anal 42–48, rays uniformly 4 in head, a little more than half length of dorsal and ending under posterior tip of dorsal; pectorals heavy, rounded, longest rays more than ½ head length, base low on sides, a short distance behind gill openings; pelvics absent. Lateral line absent. Head scaleless, body covered with poorly developed scales.



Colour, variable from slaty-blue to dull olive-green to purplish-brown; usually 10 or more dark transverse bars on the forward two-thirds of the body, some of these extending on the dorsal fin, these bars somewhat irregular and broken; under side of head and belly to vent dirty-white, tinged with general tint of upper parts.

DISTINCTIONS: The wolffishes are readily indentified by their heavy blenny-like bodies and tusk-like canine teeth. The absence of pelvic fins distinguishes them from the blennies, as do the flexible dorsal spines. This wolffish closely resembles the spotted and the northern wolffish; the bars on the sides separate it from the spotted wolffish; it is distinguished from the northern wolffish by its elongated band of central molar teeth; these extend much farther back than the bands on either side; in the northern wolffish these three bands terminate posteriorly at the same level.

SIZE: Up to a maximum length of 5 feet and a weight of 40 pounds.[49]

RANGE: Both sides of the North Atlantic Ocean; from southern Labrador to Cape Cod, occasionally straying to off New Jersey. Found at West Greenland; Iceland; the Faroes; Spitzbergen, White Sea, and Murman coast, south to the western coast of France.

Canadian distribution: Reported from regions off the Labrador coast, off Sandwich Bay.[18, 19] Trawled occasionally in the Strait of Belle Isle near Raleigh, Nfld.[209] Reported in the Gulf of St. Lawrence from Anticosti;[105] Gaspé;[450] Magdalen Islands, P.Q.; at Tignish, P.E.I.;[92] at Cheticamp, N.S.[95] Reported on the east and south coasts of Newfoundland at Quirpon, Trinity Bay, Conception Bay, Placentia Bay, off Rose Blanche, at Bay of Islands, and from various parts of the Grand Bank.[17, 18, 19] Common at Canso, N.S.,[91] and taken along the coast of Nova Scotia.[513] It is caught by commercial fishermen from Banquereau, Middle Ground, Sable Island Bank, Emerald Bank, and LaHave Bank. Not uncommon at Grand Manan and Campobello, N.B.[93, 205] Reported from Eastport, Maine.[239]

BIOLOGY AND ECONOMICS: Wolffish live in moderately deep water (10–85 fathoms), over hard bottom, apparently much scattered. They are caught in the same areas at all times of year.

The food of the wolffish consists of whelks, mussels, bar clams, and other molluscs that can be crushed by its powerful molars. Crabs, hermit crabs, sea urchins, and starfish have been found in its stomach.[49, 91]

Atlantic wolffish eggs are among the largest fish eggs being about $\frac{3}{16}$ inch in diameter, with an oil globule about $\frac{1}{12}$ inch in diameter. They are found on bottom in large, loose clumps. Such a mass was dragged up in February 1937 by the S. T. *Viernoe* near the eastern tip of Sable Island at lat 43° 53′N, long 59° 05′W.[313] The fry though pelagic are caught near bottom.

The wolffish is handled commercially, being an acceptable food fish.

The catch of wolffish from the Canadian Atlantic area for 1962 was 3,302,000 pounds, with a value of $102,000.[70b]

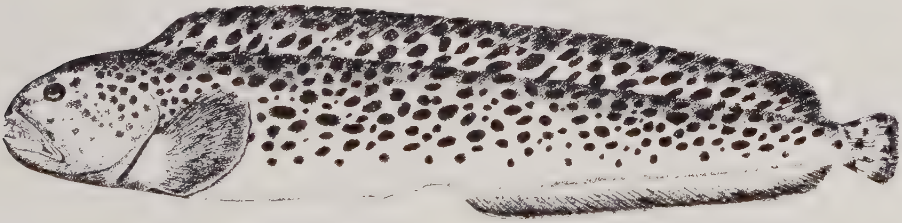
Up to 100,000 pounds per year, caught in Canadian waters, are landed in New England ports. Catches of about 1½ million pounds per year are made in the Gulf of Maine and on Georges Bank.[49]

Spotted wolffish **Loup tacheté**

Anarhichas minor Olafsen 1774

OTHER COMMON NAMES: leopardfish, spotted catfish, poisson-léopard

DESCRIPTION: Body stout, elongate, moderately compressed, greatest depth 6½ in total length, occurring about middle of pectoral fin, from whence the body tapers to a small caudal peduncle. Head 5¾ in total length, heavy, blunt, profile rounded, mouth terminal, oblique, angle under posterior edge of eye, large canine teeth in front of both jaws, the central patch of vomerine teeth not extending farther back than the flanking rows of palatine teeth on the sides. Eyes small, 6½ in head. Fins: dorsal (1) about LXXVIII, spines a little less than ½ head length, fairly uniform except that the last 3–6 spines are suddenly much shorter, making an indentation, the fin originates over the posterior part of the head and extends to the base of the caudal; caudal small, slightly rounded; anal about 46 rays, height about 3¼ in head, fin a little more than half the length of the dorsal, ending in a well-rounded fashion at the base of the caudal; pectorals longer than broad, rounded, longest rays almost equalling head length, base low on sides of body and a short distance behind gill opening; pelvics absent. Lateral line absent. Head scaleless, body with poorly developed scales.



Colour, variable from pale olive to chocolate but the upper parts, including the dorsal and caudal fins well sprinkled with blackish-brown spots, irregular in size and shape. Similar spots on the upper part of the head behind the eye.

DISTINCTIONS: The large blenny-like body, the large canine teeth, and the absence of pelvic fins distinguish this fish as a wolffish. The presence of spots, rather than bars, separates it from the Atlantic wolffish. Other distinguishing points are the short spines at the posterior end of the dorsal fin and the bands of vomerine and palatine teeth of approximately equal length.

SIZE: Despite its scientific name the spotted wolffish reaches a length of about 6 feet.[49]

RANGE: This is a northern species that occurs on both sides of the North Atlantic Ocean. On the banks off Nova Scotia, occasionally straying south to the neighbourhood of Cape Ann, Massachusetts. Common off West Greenland and occurring off East Greenland, Iceland, the Faroes, Spitzbergen, in the White Sea, off the Murman coast, around Scotland, and on the Norwegian coast south to Bergen.

Canadian distribution: Reported from the northern edge of the Grand Bank.[19] Reported frequently from Banquereau and its edges;[304, 408] also from Sable Island Bank and its edges.[49, 313] It was reported once from the lower Bay of Fundy, at Eastport, Me.[170]

BIOLOGY AND ECONOMICS: The spotted wolffish, having been caught in depths up to 250 fathoms, prefers deeper water than the Atlantic wolffish. The diet of Greenland specimens is similar to that of the Atlantic wolffish.[221]

In Greenland the spotted wolffish is eaten and the skin, because of its pattern, is tanned for leather. The species is not sufficiently abundant on the Canadian coast to have value.

Family PHOLIDAE — Gunnels

The gunnels are small, colourful fishes of inshore or intertidal regions. The body is strongly laterally compressed, lateral line poorly developed or absent; the gill membranes are united and not joined to the isthmus; the dorsal and anal fins are composed of spines only and are confluent with the caudal fin; when present, the pelvic fins are greatly reduced and each consists of one spine and one soft ray only.

Two species occur in our area.

KEY to Family PHOLIDAE

Dorsal spines 73–86 (usually 77–79); located along base of dorsal fin are 10–14 round, black spots; no light band running around head posterior to eyes .... Rock gunnel, *Pholis gunnellus* (p. 304)

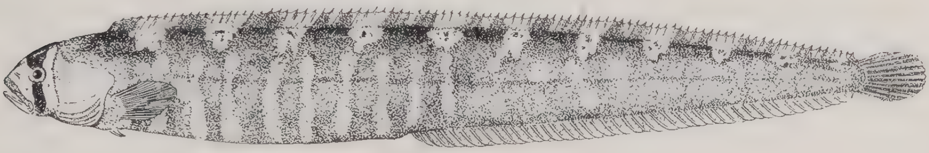
Dorsal spines 84–91; along the back are 9–11 light blotches, margined with a black strip fore and aft; a light band with black margins around head, posterior to eyes .... Banded gunnel, *Pholis fasciata* (p. 303)

Banded gunnel **Sigouine rubannée**

Pholis fasciata (Bloch and Schneider) 1801

Other common names: mottled gunnel

Description: Body elongate, much compressed, greatest depth 9 in total length, occurring before the mid-point of the body, which thereafter tapers to the caudal fin; no perceptible caudal peduncle. Head small, 8 in total length, snout blunt, mouth terminal, oblique, angle under front of eye, blunt teeth in jaws. Eye small, about 8 in head. Fins: dorsal (1) LXXXIV–XCI,[219] spines uniform in length being about 5 in head, fin originates over gill opening and extends along entire back to caudal fin with which it is confluent; caudal small, rounded; anal II, 43–46, about same height as dorsal, beginning under middle of dorsal, extending to and confluent with caudal; pectorals rounded, longest rays 3 in head, base low on side and a short distance behind gill opening; pelvics I, 1, very small and sometimes missing, located ventrally under bases of pectorals. Head naked, body with small, inconspicuous scales. Lateral line absent.[219]



Colour, yellowish-gray, the sides a brilliant scarlet; base of dorsal and adjacent upper part of sides with 10 or 11 equally spaced blotches, each made up of several brown spots with the background colour between them; a somewhat irregular cross-bar effect on the lower sides is made by brown markings; a broad brown bar with blackish margins from top of head to eye, continued below eye as a narrow but distinct band, passing behind angle of mouth and reaching ventral edge of head. Living specimens very brilliant.

Distinctions: The banded gunnel closely resembles the rock gunnel in body form. It has more dorsal spines (84–91) than the rock gunnel (73–86). Its colouration is more brilliant and the prominent spots on the dorsal fin are subdivided rather than single black spots as in the rock gunnel.

Size: The largest Canadian specimen on record was 10½ inches long;[496] it is said to reach a length of about 12 inches in Greenland.[219]

Range: An arctic species occurring in the North Pacific Ocean, in the Sea of Okhotsk, and at the Kuril Islands; in Bering Sea; in Hudson Bay; on the Labrador coast and on the West Greenland coast.[219]

Canadian distribution: Reported from Cape Merry Peninsula, Hudson Bay.[496] Recorded on the Labrador coast at a number of points between Hamilton Inlet and Saglek Bay (lat 58°30′N); always below low tide level.[25, 172]

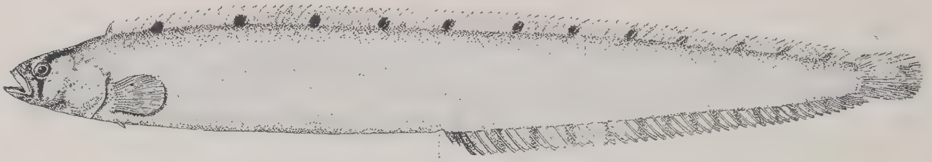
Rock gunnel

Sigouine de roche

Pholis gunnellus (Linnaeus) 1758

OTHER COMMON NAMES: gunnel, butterfish, tansy, tissy, rock eel, anguille de roche

DESCRIPTION: Body elongate, much compressed, greatest depth 8½ in total length, occurring just before mid-point of body, tapering gradually to caudal fin; no perceptible caudal peduncle. Head small, compressed, 8½ in total length; snout rather blunt, mouth terminal, oblique, lower jaw projecting slightly, angle in front of eye, blunt teeth in a single row in upper jaw and in several rows in lower jaw, front ones largest. Eye small, 7 in head. Fins: dorsal (1) LXXIII–LXXXVI, low, spines uniformly 5 in head, fin begins above gill opening and ends at base of caudal fin from which it is separated by a shallow notch; caudal small, rounded; anal II, 37–44, spines very short, soft rays about 3 in head, fin begins under middle of dorsal and extends to base of caudal from which, like the dorsal, it is separated only by a shallow notch; pectorals rounded, longest rays 2 in head, base low on sides, just behind gill opening; pelvics I, 1, very small, located ventrally under base of pectorals. Scales small, inconspicuous, covered with a thick layer of slimy mucus. Lateral line absent.



Colour, variable, usually matching background; from yellowish to olive to brownish to reddish tints, belly pale to yellowish-white; an oblique dark streak above and below eye; a row of 10–14 round black spots with pale edges, equally spaced along base of dorsal fin; caudal and anal fins yellowish.

DISTINCTIONS: The rock gunnel is distinguished by its slippery, compressed body with a low spinous fin along almost the entire dorsal edge. Its small head distinguishes it from the snake blenny and wrymouth. The almost vestigial pelvic fins and the two short spines of the anal fin assist in separating it from the various shannies. It is closely related to *Pholis fasciata*, which only occurs from Labrador northwards; the rock gunnel has fewer dorsal spines (73–86 as compared to 84–91 in *P. fasciata*); the rock gunnel has pale edged black spots on the dorsal fin; *P. fasciata* has paler, subdivided spots there.

SIZE: Up to a length of 12 inches, but usually not over 9 inches.

RANGE: Along shore and occasionally offshore on both sides of the North Atlantic Ocean; from the Labrador coast to off Delaware Bay and known from Georges and Browns banks and as fry from the Grand Bank. At Greenland; from the Murman coast to the west coast of France.

Canadian distribution: The most northerly record for the rock gunnel is from Nutak Harbour on the Labrador coast (lat 57°35′N);[172] elsewhere on that coast it has been recorded from Hamilton Inlet[240] and from points between St. Lewis Sound (lat 52°18′N) and West Turnavik Island (lat 55°15′N).[25] Reported from Raleigh, Nfld., on the Strait of Belle Isle[209] and at Blanc

Sablon, P.Q.[19] In the Gulf of St. Lawrence it is common at Anticosti;[405] found near Tadoussac, P.Q.;[514] Gaspé, P.Q.;[450] from the Chaleur Bay at Port Daniel, P.Q.;[229] Miramichi estuary;[312] occasional in Malpeque Bay, P.E.I.;[334] common at the Magdalen Islands and at Cheticamp, N.S.[95] Around the coast of Newfoundland at Port-au-Port Bay, Trinity Bay, and at Bay Bulls; taken pelagically off Port-au-Port Bay, off Bonavista Bay, and on the western and southern portions of the Grand Bank.[17, 18, 19] Common at Canso, N.S.;[91] common along the shore of Nova Scotia.[232, 513] Common in St. Mary Bay and the Bay of Fundy including Passamaquoddy Bay, the Annapolis Basin, and Minas Basin.[93, 205]

BIOLOGY AND ECONOMICS: Along shore the rock gunnel is a frequent inhabitant of tide pools, where it hides under stones or seaweed; it avoids mud bottom. It has also been found at considerable depths, being recorded once in 100 fathoms on Georges Bank.[412] It is found in cod and pollock stomachs at moderate depths; it is of minor importance as food for these commercial species.

The rock gunnel feeds on amphipods, shrimp, and marine worms; specimens on the Labrador coast are reported as feeding almost exclusively on amphipods.[25]

The eggs of the rock gunnel are large, about $\frac{1}{12}$ inch in diameter, with a large oil globule; they are adhesive and are deposited in crannies among rocks, in dead shells, etc. Sometimes they adhere in balls. In Europe the rock gunnel spawns in winter and there is evidence of a similar habit in the Bay of Fundy as fry have been caught there in early summer.[205]

Family STICHAEIDAE Pricklebacks

The pricklebacks are closely related to the gunnels (Pholidae) and, like them, are fishes of shallow inshore waters of northern seas. They are generally elongate fishes, with poorly developed lateral line. The gill membranes are united and may be joined to, or free from, the isthmus. The long dorsal fin is composed entirely of spines, the median fins are sometimes partly or completely confluent (joined together), the pelvic fins, if present, are reduced and jugular.

Nine species of pricklebacks occur in our area.

KEY to Family STICHAEIDAE

1 Pelvic fins absent; lower jaw projecting; head broad, not compressed .... Wrymouth, *Cryptacanthodes maculatus* (p. 307)

Pelvic fins present although sometimes reduced 2

2 Orbital tentacles or cirri present, 2 pairs, one pair longer .... Yarrell's blenny, *Chirolophus ascani* (p. 306)

Orbital tentacles or cirri absent 3

3 Dorsal fin spines less than 52; anal fin rays less than 37; body laterally compressed 4

Dorsal fin spines more than 56; anal fin rays more than 37; body less compressed 6

4 Four lateral lines; anal fin rays 29–32; pectoral fin rays 17 or 18 .... Fourline snakeblenny, *Eumesogrammus praecisus* (p. 308)

One or 2 lateral lines; anal fin with 30–37 rays; pectoral fin rays 15 or 16 5

5 Five distinct black blotches along dorsal fin; one incomplete lateral line, ending under anterior half of dorsal fin .. Arctic shanny, *Stichaeus punctatus* (p. 313)

One oblong black blotch on anterior portion of dorsal fin (about 5th–10th spines); one complete lateral line along mid flank, a 2nd incomplete lateral line above it, ending under anterior half of dorsal fin .... Radiated shanny, *Ulvaria subbifurcata* (p. 314)

6 Lower rays of pectoral fins elongated, free from membrane and almost finger-like .... Daubed shanny, *Lumpenus maculatus* (p. 309)

Lower rays of pectoral fins not elongate 7

7 Dorsal fin rays 71–85 .... Snake blenny, *Lumpenus lumpretaeformis* (p. 311)

Dorsal fin rays less than 70 8

8 Dorsal fin rays 61–66; pectoral fin rays 15–17; anal fin of uniform height .... Slender eelblenny, *Lumpenus fabricii* (p. 310)

Dorsal fin rays 58–63; pectoral fin rays 13–15; anal fin low in front, higher behind .... Stout eelblenny, *Lumpenus medius* (p. 312)

Yarrell's blenny — Toupet marbré

Chirolophus ascani (Walbaum) 1792

DESCRIPTION: Body elongate, compressed, greatest depth about 6 in total length, occurring near tip of pectoral fin, body tapering slightly and then rapidly near tail. Head 5¼ in total length, compressed, rounded in front, upper angle of preopercle acute; mouth terminal, lower jaw longer so that mouth opening is directed obliquely upward, lips fleshy, small teeth on jaws, angle in front of eye; 2 pairs of erect, plume-like appendages of the skin between eyes, front pair short, hind pair variable but substantially longer up to half head length, a short skin flap near nasal aperture and 4 or 5 short flaps on top of head behind the high one. Eye moderate, about 7 in head. Fins: dorsal (1) L–LIII, length of spines uniform, about 3 in head, fin begins over gill opening and extends to caudal from which a notch separates it, in males and old females a cutaneous extension on the first spine; caudal moderate, rounded; anal I, 35–40, similar in height to dorsal, begins under 13th dorsal ray and extends almost to caudal; pectorals, moderate, rounded, less than 2 in head, base behind gill opening; pelvics, a few rays only, length about 3 in head, located ventrally in front of pectorals. Body covered with minute scales. No lateral line.[408]

Colour, yellow to reddish-brown with darker cross bands, sometimes resolved into separate spots; sometimes uniform in colour.[408]

DISTINCTIONS: The blenny-like form combined with the fleshy projections on top of the head distinguish this species. *Chirolophus galerita* (Linnaeus) 1766 is regarded as a synonym.

SIZE: Up to 7¼ inches in length.

RANGE: A northern species. Known tentatively from Baffin Island to the

Gulf of St. Lawrence and eastern Newfoundland. Also from Iceland, the Faroes, Orkneys, Shetlands, Norway, Kattegat, and the British and Irish coasts.[408]

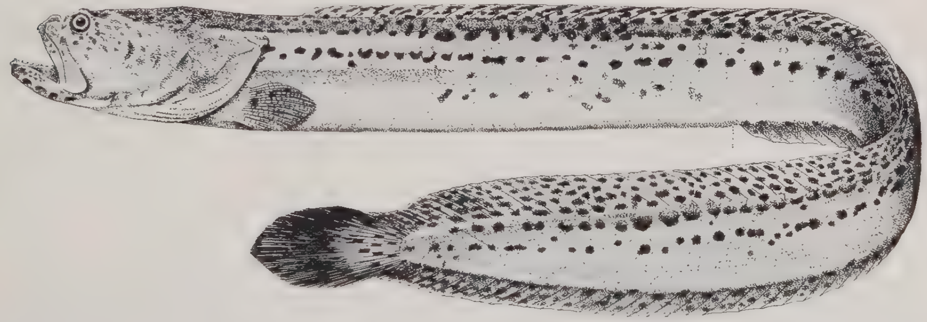
Canadian distribution: Only reported as young under ¾ inch long. From Lake Harbour, Baffin Island;[122] from off Battle Harbour, Labrador, the Strait of Belle Isle, off St. Anthony, Nfld., off White and Conception bays, Nfld.;[19] taken frequently (63 specimens reported) in Cabot Strait, the northeastern Gulf of St. Lawrence from Gaspé and Anticosti to Bay of Islands, and on southeastern Grand Bank.[102]

Wrymouth — Terrassier tacheté

Cryptacanthodes maculatus Storer 1839

OTHER COMMON NAMES: ghostfish, spotted wrymouth

DESCRIPTION: Body very elongate, eel-like, greatest depth 14 in total length, much compressed. Head 7 in total length, flat-topped, snout very blunt, mouth terminal, oblique, lower jaw projecting markedly, angle of mouth under posterior edge of eye; stout, conical teeth in jaws and on vomer and palatines; conspicuous mucous secreting pits on sides of head. Eye small, 14 in head. Fins: dorsal (1) LXXIII–LXXVII, low, longest spines in posterior portion being 4 in head, all spines stout and somewhat hidden by skin, fin begins over middle of pectoral, extends full length of back and is continuous with caudal; caudal rather small, oval-pointed; anal 47–50, low, rays about 7 in head, beginning under 20th spine of dorsal, extending to and continuous with caudal; pectorals small, longest rays 3½ in head, located low on sides behind gill opening; pelvics absent. Lateral line not evident. Body naked.



Colour, varying shades of brown or reddish-brown, belly grayish-white; upper part of body with three irregular rows of small dark brown spots running from the head to the tail; top of head thickly spotted; dorsal and anal fins with smaller brown spots. Albino specimens have been seen.

DISTINCTIONS: The long, eel-like body distinguishes the wrymouth from most other fishes. The blunt head and oblique mouth are distinctive. The wrymouth may be distinguished from all the other blennies by the absence of pelvic fins.

SIZE: Up to a length of 3 feet.

RANGE: Along the Atlantic coast of North America from southern Labrador and the Grand Bank to off New Jersey.

Canadian distribution: Pelagic off Hawke Bay, Labrador; near Blanc Sablon, P.Q.[20] Found at

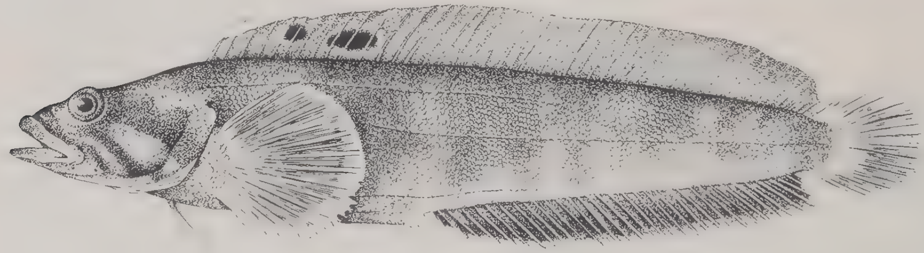
Gaspé, P.Q.;[450] pelagic on Orphan Bank;[102] occasional in Miramichi Bay.[312] Reported for northeastern and middle Grand Bank, Conception Bay, St. Mary's Bay, Placentia Bay, Fortune Bay, Nfld., and off St. Pierre.[17, 18, 19] Trawled occasionally near Canso, N.S.[91] Two specimens were taken on Sable Island Bank in the winter of 1935.[513] Occasional in the Bay of Fundy; reported frequently in Passamaquoddy Bay and at the mouth of the Magaguadavic River.[205, 395, 531] Found in Saint John Harbour, N.B.[93]

BIOLOGY AND ECONOMICS: The wrymouth lives on soft bottom, where it burrows in mud, sometimes building an extensive, branching system of tunnels.[531] It occurs in shallow water and also in depths up to 60 fathoms.[513] Food includes amphipods, mud shrimp, and under aquarium conditions it eats pieces of fish muscle.[531] While the eggs and early fry are not known, the presence of small fry in early spring in northern waters suggests winter spawning.[49]

Fourline snakeblenny Quatre-lignes atlantique

Eumesogrammus praecisus (Krøyer) 1837

DESCRIPTION: Body stout, only moderately elongate, greatest depth 5½ in total length, occurring just before tip of pectoral fin; back slightly arched. Head 4½ in total length, pointed, mouth terminal, lower jaw projecting, angle of jaw under middle of eye, small teeth in jaws and on vomer and palatines. Eye 7 in head. Fins: dorsal (1) XLVII–XLIX, highest spines about middle of fin and about 3 in head, anterior and posterior spines a trifle shorter, fin begins over gill opening and reaches base of caudal to which it is attached by membrane; caudal moderate, rounded; anal I–II, 30–33, middle rays longest, 3 in head, spines graduated and shorter, last 3 rays spine-like, fin begins under 15th spine of dorsal and ends just before the caudal from which it is distinct; pectorals large, rounded, longest rays 1⅗ in head, bases a short distance behind gill opening; pelvics, I, 3, last ray longest being 3 in head, located ventrally considerably in front of base of pectoral. Body covered with small scales. Lateral line continuous along middle of side and 3 other incomplete lines anteriorly on each side, one above and 2 below the actual lateral line.



Colour, sides of head somewhat banded; a large, oval, black spot on the dorsal fin from 8th to 11th spines, this spot white-edged, sometimes a smaller white-edged spot in front of this; pectoral, anal, and caudal fins dark with light borders.[220]

DISTINCTIONS: This species is somewhat stouter-bodied than the arctic shanny and it is readily distinguished by the three accessory but incomplete lines on the sides, one above and two below the lateral line. Not more than two black spots on the dorsal fin, whereas the arctic shanny has at least five. It can be distinguished from the radiated shanny by the two incomplete lines below the lateral line; the radiated shanny lacks these.

SIZE: Up to a length of 8½ inches.[220]

RANGE: In North America known only from Victoria Island, N.W.T., from Hudson Bay, Ungava Bay, and the Labrador coast. Elsewhere it occurs at West Greenland; Beaufort Sea, Bering Sea, and Sea of Okhotsk.

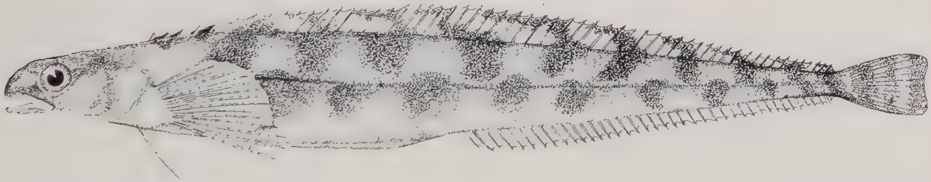
Canadian distribution: Reported from Walker Bay, Victoria Island, N.W.T.[518] Found at a depth of 50 fathoms in the southwestern part of Hudson Bay and from a cod stomach at Port Burwell, Ungava Bay.[124, 496] Known on the Labrador coast from Kangalaksiorvik Fjord (lat 59°25′N), from Emily Harbour (lat 54°33′N), and from St. Lewis Sound (lat 52°15′N) in 10–18 fathoms.[23, 25]

Daubed shanny — Lompénie tachetée

Lumpenus maculatus (Fries) 1837

OTHER COMMON NAMES: langbarn

DESCRIPTION: Body elongate, somewhat compressed, greatest depth 10–11 in total length, occurring at posterior end of pectoral fin, body tapering very gradually to base of caudal. Head 5⅔ in total length, snout blunt, upper jaw longest; mouth slightly inferior, angle under middle of eye, teeth on jaws, vomer, and palatines, 2 strong canine teeth in front of each jaw. Eye large, 5 in head. Fins: dorsal (1) LVIII–LXI, first 6 spines quite short, subsequent ones gradually increasing to about 12th spine which is 4½ in head, after which height is uniform with last third of fin a trifle lower, fin begins over gill opening and extends to caudal peduncle; caudal moderate, rounded to sub-truncate, completely separated from dorsal and anal; anal 35–38, a little higher than dorsal, longest rays 3½ in head, begins under 25th spine of dorsal and ends under posterior end of dorsal; pectorals large, rounded, with lower 5 rays projecting beyond upper ones, their tips free, longest rays 1⅗ in head, base low on side, a short distance behind gill opening; pelvics with rays 3 in head, located ventrally in front of base of pectorals. Body covered with small scales. Lateral line indistinct.



Colour, yellowish, sides marked with irregular dark spots; belly paler; a series of oblique dark bands on dorsal; four dark bands on caudal; anal, pectoral, and pelvic fins yellowish.

DISTINCTIONS: This shanny is closely related to the snake blenny and other species of the genus *Lumpenus*. It may be distinguished from other members of the genus by the extended lower rays of the pectoral fins. Its body is deeper than that of the snake blenny; its mouth is slightly inferior and the lower jaw shorter than the upper. The mouth extends to the middle of the eye in the shanny but stops short of it in *Lumpenus*.

SIZE: Up to a length of 7 inches.[49]

RANGE: An arctic species, found in the Bering Sea near Ellesmere Land; from Labrador to Cape Cod; east and west Greenland; Iceland; Jan Mayen; Spitzbergen, northern Sweden and Norway; Murman coast and Barents Sea.

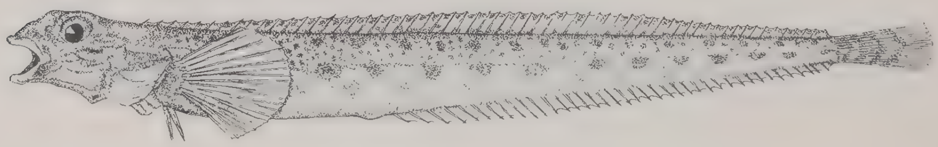
Canadian distribution: Reported from Jones Sound, between Ellesmere Land and Devon Island.[220] From Hebron Fjord, Labrador;[172] from Nain Bay, from Lake Melville, and from St. Lewis Sound (lat 50°22′N).[25] In the Trois Pistoles region, P.Q.[357, 514] On the Grand Bank and at St. Mary's Bay, Nfld.[17, 18] On the edge of the Laurentian Channel, off Sydney, N.S.[17] Reported without definite locality from fishing grounds off the coast of Nova Scotia.[232]

BIOLOGY AND ECONOMICS: The daubed shanny is found in deep water, being trawled in 15–60 fathoms on the Labrador coast.[25, 172] It has similar habits in Europe but is said to spawn in shoal water.

Slender eelblenny **Lompénie élancée**

Lumpenus fabricii (Valenciennes) 1836

DESCRIPTION: Body elongate, moderately compressed, greatest depth about 13 in total length, body tapering gradually to base of caudal. Head 8½ in total length, snout blunt, mouth terminal, angle almost under front edge of eye, jaws about equal in length, a row of small conical teeth in each jaw, older specimens with a few teeth on palatines. Eye 7 in head. Fins: dorsal (1) LXIII–LXV (LXII in one Labrador specimen),[172] first 7 spines graduated, following ones uniformly 3½ in head, with posterior 15–20 shorter, fin begins above gill opening and extends to base of caudal; caudal moderately large, rounded, distinct from dorsal and anal; anal 41–44, first ray short, subsequent ones 3½ in head, fin begins under 25th dorsal spine and ends near base of caudal; pectorals large, rounded, longest rays 1½ in head, base low on side, a short distance behind gill opening; pelvics I, 3, rays 3 in head, located ventrally in front of bases of pectorals. Body covered with small scales. Lateral line discernible.



Colour, light brown with large pale rounded blotches, head yellowish; pectorals yellowish, mottled, with a dusky spot at base.

DISTINCTIONS: *Lumpenus fabricii* closely resembles the other members of the genus. It can be distinguished from *L. medius* by its uniform anal fin, whereas that of *L. medius* is low anteriorly; it has more dorsal spines than *L. medius* but there is some overlapping. It differs from the snake blenny in having a somewhat stouter body and in having teeth on the palatines when mature; the snake blenny lacks palatine teeth at all ages; *L. fabricii* has fewer dorsal spines and anal rays than the snake blenny.

SIZE: Up to a length of 13½ inches.[220]

RANGE: A circumpolar, arctic and subarctic species. Occurs from Hudson Bay to the northern Gulf of St. Lawrence. Also in Bering Sea; west Greenland; Murman coast; White Sea and Novaya Zembla.

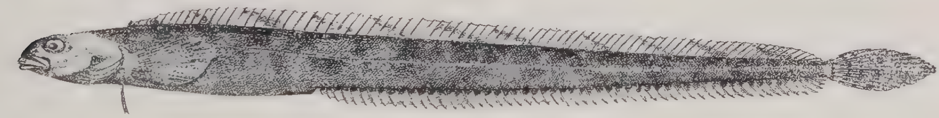
Canadian distribution: This species is reported from several points in the northwestern part of Hudson Bay and off Fort Churchill, Manitoba.[406] From a number of points in Ungava Bay as fry, and from cod stomachs.[124] One specimen 9 inches long was taken in 6–10 fathoms at Saglek Bay, Labrador, in 1954.[172] Reported at Anticosti Island in the Gulf of St. Lawrence.[405] This species is reported from "Wellington Sound".[220] It is possible that Wellington Channel, Northwest Territories, is meant. If so, it is another Canadian record.

Snake blenny — Lompénie-serpent

Lumpenus lumpretaeformis (Walbaum) 1792

OTHER COMMON NAMES: blennie-serpent

DESCRIPTION: Body very elongate, moderately compressed, greatest depth variable from 16 to 25 in total length,[497] occurring just behind end of pectoral fin, remainder of body tapers very gradually to caudal fin; caudal peduncle small, not clearly marked off. Head 8½ in total length, slender, snout blunt, lower jaw slightly shorter than upper, mouth moderate, terminal, angle of jaw under front of pupil of eye, a single row of rather small conical teeth in each jaw. Eye large, 5⅓ in head. Fins: dorsal (1) LXVIII–LXXXV (Labrador specimens LXXIV–LXXVII),[25] first 5 spines graduated, longest spines 4 in head, posterior ones a trifle shorter, fin begins over gill opening and ends on caudal peduncle, just before caudal; caudal moderate, oval in shape, middle rays longest, distinct from dorsal and anal; anal 49–62 (Labrador specimens 50–53[23]), longest rays 3½ in head, first and last shorter, fin ¾ as long as dorsal, ending on caudal peduncle under end of dorsal; pectorals moderately large, rounded, 1½ in head, base low on side, a short distance behind gill opening; pelvics I, 3, rays 3½ in head, located ventrally, slightly in front of base of pectorals. Body covered with small scales. Lateral line indistinct but discernible.



Colour, whitish to pale brown on the back, with darker-brown mottling; dorsal and caudal fins marked obliquely with many pale bars; anal fin rays brown; pectorals brown; pelvics white.[49]

DISTINCTIONS: The snake blenny is readily identified by its elongate form and spinous dorsal, extending almost the full length of the body; its blunt head and included lower jaw separate it from the sand lance, which has a pointed head with the lower jaw markedly projecting. It is more slender than the daubed shanny and the pointed tail contrasts with the square-ended tail of the daubed shanny; the arctic and radiated shannies are much stouter fish. The presence of pelvic fins separates it from the wrymouth, which has none.

SIZE: Up to 19 inches in length.

RANGE: North Atlantic and Arctic oceans. From Baffin Island and Labrador to Cape Cod. East and West Greenland, Iceland, Faroes, Spitzbergen, south to the Baltic Sea and to Scotland.

Canadian distribution: Reported at Baffin Island, and on the Labrador coast as fry from Hebron;[122] from Nain;[25] from Semekutak Island;[172] from Hamilton Inlet[210] and from off North Cape, near Sandwich Bay.[17] In the Gulf of St. Lawrence from the Trois Pistoles, P.Q., region[357, 514] and from Port-au-Port Bay, Nfld.[17] From southern, middle, and western Grand Bank.[17, 18, 19, 20, 497] St. Mary Bay, N.S.; lower Bay of Fundy and Passamaquoddy Bay.[205]

BIOLOGY AND ECONOMICS: The snake blenny is a shoal water fish found from a fathom or so below low tide down to 40 or 50 fathoms; it occurs on muddy and hard bottom.

It is a variable species, with a tendency to break up into local races. In any one area the fin ray variation is reduced in extent. Vladykov[497] ascribed subspecific rank to these different races and described one subspecies from the Gulf of St. Lawrence and another from Newfoundland.

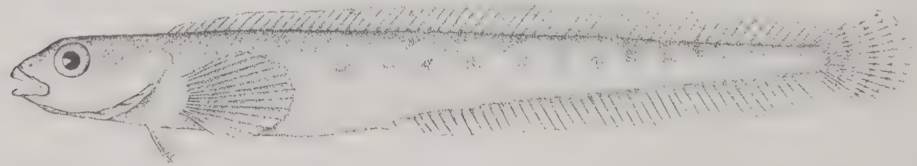
In the North Sea the species eats amphipods, copepods, small starfish, and very small shellfish. The snake blenny is eaten by cod, pollock, and halibut and doubtless by other large species.

It probably spawns in autumn or winter, as it does in Europe, since pelagic fry have been caught in the Gulf of Maine from March to May.[49]

Stout eelblenny **Lompénie naine**

Lumpenus medius (Reinhardt) 1838

DESCRIPTION: Body elongate, moderately compressed, greatest depth 10½ in total length, occurring at end of pectoral fin, body tapering gradually to caudal fin. Head 5½ in total length, snout blunt; mouth small, terminal, angle under front edge of eye, single row of small conical teeth in each jaw, teeth on palatines. Eye 4½ in head. Fins: dorsal (1) LIX–LXII[25] (Greenland specimens LX–LXXIII[220]) longest spines 4 in head, the first few and the last few spines shorter, fin begins over gill opening and ends at base of caudal with which it is united; caudal moderate, rounded; anal 40–43,[25, 219] rays gradually increasing in length so that the forward part is distinctly lower than the posterior part, longest rays 3¼ in head, fin begins under 21st dorsal spine and ends in union with caudal; pectorals moderately large, rounded, longest rays 1½ in head, base low on sides, a short distance behind gill opening; pelvics I, 3, longest rays



4½ in head, located ventrally and noticeably in front of base of pectorals. Body covered with small scales. Lateral line obscure.

Colour, yellowish with a few darker mottlings. Living specimens with red markings on dorsal fin; these vanish when the fish dies.[25]

DISTINCTIONS: This blenny is distinguished from the other species of *Lumpenus* by the shape of the anal fin, which is low in front and higher posteriorly. Its rounded caudal fin differs from the oval one of the snake blenny, from which it also differs by having the dorsal and anal fins united with the caudal.

SIZE: Up to a length of 5½ inches.[220]

RANGE: An arctic species known from Kamchatka, Bering Sea, coast of Labrador, East and West Greenland, Spitzbergen, Barents Sea, White Sea, and Kara Sea.[25, 220]

Canadian distribution: First reported from the Labrador coast in 1950 at St. Lewis Sound (lat 52°15′N) and Kangalaksiorvik Fjord (lat 59°25′N).[23] Obtained in 1951 in Lake Melville, Hamilton Inlet,[25] and two specimens were caught in Hebron Fjord in July 1954.[172] Postolaky[355] reports a southerly record off Cape Breton Island at lat 46°16′N, long 59°29′W. The specimen was found in a cod stomach. (See also *Stichaeus punctatus.*)

BIOLOGY AND ECONOMICS: This species has been caught in depths of 9–65 fathoms, where the temperature did not exceed 27 F.[25, 172]

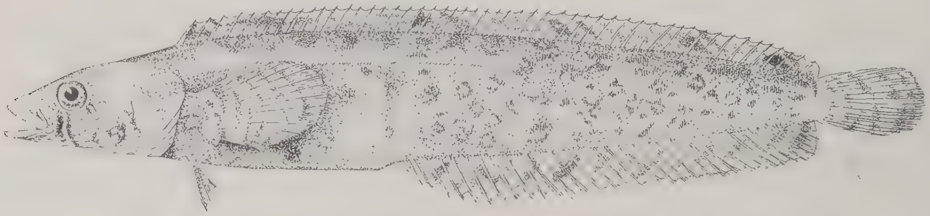
Arctic shanny **Stichée arctique**

Stichaeus punctatus (Fabricius) 1780

DESCRIPTION: Body moderately elongate, little compressed, greatest depth 6½ in total length, occurring at tip of pectoral fins. Head 5 in total length, pointed, mouth terminal, lower jaw a trifle longer than upper, angle well in front of eye, teeth in jaws in narrow bands, also on vomer and palatines. Eye 5½ in head. Fins: dorsal (1) XLVIII–L, spines uniformly 7 in head, except first 2 and last 2 which are slightly shorter, fin begins over gill opening and ends just before base of caudal; caudal small, rounded, separate from dorsal and anal; anal I, 32–35 (in Hudson Bay 36–38),[436] spine and first 3 soft rays graduated, other rays, except last 2, uniformly 3½ in head, fin begins under 18th or 19th dorsal spine and ends under posterior tip of dorsal; pectorals moderately large, rounded, longest rays 1½ in head, base of fin low on side and ⅓ its own length behind gill opening; pelvics small, first ray longest, 3½ in head, situated ventrally, bases midway between gill opening and base of pectorals. Head and cheeks without scales; small scales cover body. Lateral line single, high on side, terminates under middle of dorsal.

Colour, brownish to bright scarlet, whitish below, lower part of head with six or seven short dark bars; some mottling on sides and on caudal, anal, and pectoral fins; five or six large dark spots spaced along dorsal fin, each with a white posterior edging; pelvics yellow.

DISTINCTIONS: The arctic shanny is considerably stouter than the snake blenny and the other *Lumpenus* species; its rounded pectoral fin without any extended rays separates it from the daubed shanny. Coloured somewhat like the rock gunnel, it is easily distinguished by its well-developed pelvic fins. It most closely resembles the radiated shanny in general form but it has at least five dark markings on the dorsal fin, whereas the radiated shanny has a single dark blotch on the dorsal fin. Its single, short lateral line is also distinctive.



SIZE: Up to a length of 8½ inches.[95]

RANGE: A circumpolar arctic species; it occurs in Hudson Bay; on the Labrador coast, and south to Mount Desert, Maine; West Greenland; in Bering, Okhotsk and Japanese seas; northern Siberia.

Canadian distribution: In Hudson Bay, off Churchill, Man.[496] On the Labrador coast at Cape Mugford (lat 57°48′N); at Webeck Harbour (lat 54°55′N); at Domino Harbour (lat 53°30′N) and at Niger Sound (lat 52°12′N).[25] Reported from Battle Harbour, Labrador;[240] from Red Bay[496] and from Raleigh, Nfld.[209] on opposite sides of the Strait of Belle Isle. Reported from a cod stomach at Cheticamp, N.S.,[95] from Chedabucto Bay and Canso, N.S.[61] Fry reported doubtfully as the arctic shanny by Dunbar[122] at Baffin Island and Hebron, Labrador, and by Dannevig,[102] without qualification, near Missaine Bank are believed to have been *Lumpenus medius.*[25]

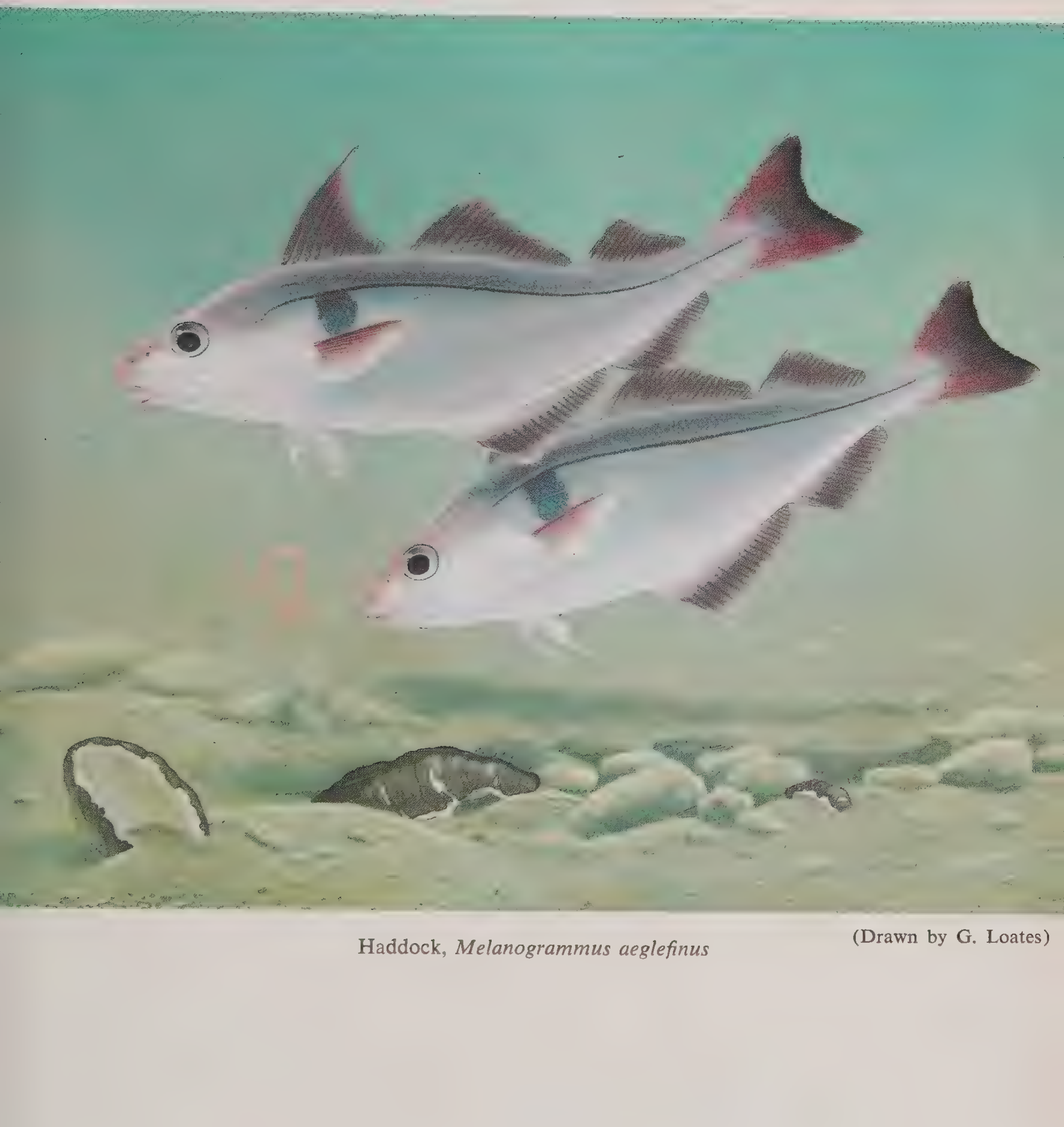
BIOLOGY AND ECONOMICS: Arctic shanny are often found in cod stomachs and are also eaten by the Greenland halibut.[220]

Radiated shanny **Ulvaire deux-lignes**

Ulvaria subbifurcata (Storer) 1839

DESCRIPTION: Body stout, only moderately elongate, greatest depth 5½ in total length, back slightly arched. Head 4½ in total length, bluntly pointed, dorsal profile convex, upper corner of gill cover slightly produced in a fleshy tab; mouth terminal, jaws equal, angle under middle of eye, small teeth in jaws. Eye large, 4 in head. Fins: dorsal (1) XLIII–XLIV, first 3 and last 3 spines graduated, remainder fairly uniform, their length 2¾ in head, fin begins over gill opening and continues to the base of the caudal fin with which it is united by membrane; caudal moderate, rounded; anal 30, first 2 and last rays shorter, remainder uniformly 3 in head, fin begins under 14th spine of dorsal and ends a short distance before the caudal from which it is separated by a short space; pectorals moderately large, rounded, longest rays 1½ in head, base low on sides, a short distance behind gill opening; pelvics small, longest ray 2½ in head, located ventrally well in front of base of pectorals. Body covered with small scales. Lateral line continuous along middle of side, bifurcate with an upper branch that extends to above tip of pectoral.

Colour, brownish, with pale to yellowish belly; a large, oval, dark blotch from 5th to 10th spines of dorsal and 4 or 5 less distinct oblique bars behind this on

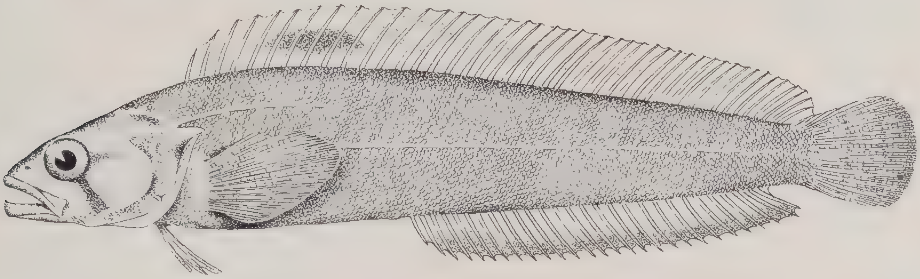


Haddock, *Melanogrammus aeglefinus*

(Drawn by G. Loates)

balance of fin; a black band runs obliquely across the cheek from lower edge of eye; faint cross bars on caudal.

DISTINCTIONS: The radiated shanny closely resembles *Eumesogrammus praecisus* in form and in the marking on the dorsal fin; but it has no lines below the main lateral line, whereas *Eumesogrammus* has two short lines there. Its rounded pectorals, without extended rays, separate it from the daubed shanny.



SIZE: Up to a length of 6½ inches.[49]

RANGE: Occurs only on the east coast of North America from the Strait of Belle Isle to the Woods Hole region of Massachusetts.

Canadian distribution: Occurs at Raleigh, Nfld., on the Strait of Belle Isle;[209] on the north shore of the Gulf of St. Lawrence at Pointe du Maurier, P.Q.;[49] at Trois Pistoles, P.Q.;[494] at Gaspé, P.Q.;[450] rare in Miramichi estuary;[312] near the Magdalen Islands, P.Q. At Trinity Bay, Nfld.[17] At Canso, N.S.,[91] and at Shad Bay, Halifax Co., N.S.[301] Common in St. Mary Bay and the Bay of Fundy, but scarce in Passamaquoddy Bay.[205]

BIOLOGY AND ECONOMICS: The radiated shanny lives among sea weed on rocky shores and on hard bottom at greater depths. Its presence in cod stomachs suggests that it lives down to at least 30 fathoms. It spawns in summer.

Family ZOARCIDAE Eelpouts

The eelpouts, numbering some 50 or more species, form a closely-knit family of bottom-living northern fishes. The general characteristics: elongate and rather slender-bodied, head elongate, gill membranes joined to the isthmus, dorsal and anal fins composed of soft rays principally, and confluent with caudal fin; pelvic fins, if present, jugular and of soft rays only.

Thirteen species are reported to occur in Canadian Atlantic waters.

KEY to Family ZOARCIDAE

1 Pelvic fins absent 2
Pelvic fins present 3

2 Teeth present on jaws .... Atlantic soft pout, *Melanostigma atlanticum* (p. 328)
Teeth absent .... Fish doctor, *Gymnelis viridis* (p. 317)

3 Posterior part of dorsal fin composed of short, stiff spines suggesting a distinct break between dorsal and caudal fins .... Ocean pout, *Macrozoarces americanus* (p. 326)

Dorsal fin continuous, without short, stiff spines on posterior part 4

4 Body elongate but stout; body depth (at anus) into body length 7–13 times (genus *Lycodes*) 5

Body elongate and eel-like; body depth (at anus) into body length 16–30 times (genus *Lycenchelys*) 11

5 Distance between snout and anus 35–44% of total length; peritoneum usually black; ventral lateral line present 6

Distance between snout and anus 45–52% of total length; peritoneum usually light; ventral lateral line absent 9

6 Pectoral fin rays 17–20 7

Pectoral fin rays 21–24 8

7 Anal fin rays 79–85; mid lateral line present .... Pale eelpout, *Lycodes pallidus* (p. 322)

Anal fin rays 96–102; mid lateral line absent .... Vahl's eelpout, *Lycodes vahlii* (p. 325)

8 Mid lateral line present .... Esmark's eelpout, *Lycodes esmarki* (p. 320)

Mid lateral line absent .... Atlantic eelpout, *Lycodes atlanticus**

9 Anal fin rays 77–82; dorsal fin rays 97–104 .... Laval's eelpout, *Lycodes lavalaei* (p. 321)

Anal fin rays 64–77; dorsal fin rays 82–95 10

10 Pectoral fin rays 16–18 (rarely 19); mid lateral line present; scales usually absent .... Polar eelpout, *Lycodes turneri* (p. 324)

Pectoral fin rays 19–21; mid lateral line very distinct; scales weakly developed but present .... Arctic eelpout, *Lycodes reticulatus* (p. 323)

11 Dorsal and anal fins short, each of less than 100 rays, usually about 90 (92 and 88, respectively) .... Wolf eelpout, *Lycenchelys verrilli* (p. 319)

Dorsal and anal fins long, each composed of more than 100 fin rays 12

12 Dorsal fin rays 118; anal fin rays 110 .... Common wolf eel, *Lycenchelys paxillus* (p. 317)

Dorsal fin rays 123; anal fin rays 117 .... Sars' wolf eel, *Lycenchelys sarsi* (p. 318)

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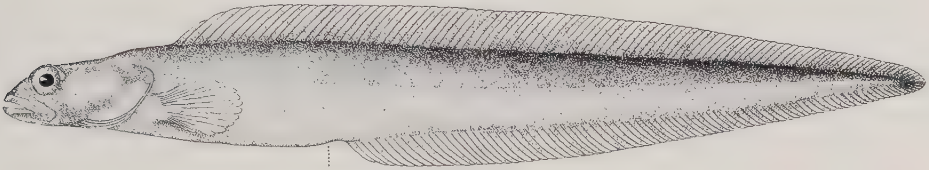
*A detailed account of this species was not possible at the time of writing because of confused nomenclature.

Fish doctor **Unernak**

Gymnelis viridis (Fabricius) 1780

OTHER COMMON NAMES: green ocean pout, anguille de mer

DESCRIPTION: Body elongate, greatest depth about 11 in total length, occurring near tip of pectoral, gradually tapering to tail. Head about 7 in total length, mouth terminal, moderate, angle under posterior edge of eye, small conical teeth in jaws and on vomer and palatines. Eye 7 in head. Fins: dorsal (1) 97–100, longest rays 2½ in head, fin long, originating over base of pectoral and continuing to end of body; caudal pointed, indistinguishable from dorsal and anal; anal about 80, a little lower than dorsal, originating 1½ times length of pectoral fin behind tip of pectoral and continuing to tip of body; pectorals moderate, rounded, about ⅔ length of head, base on middle of side, a short distance behind gill opening; no pelvic fins. Lateral line straight, faint. Body without scales.



Colour, pale brownish to greenish, sometimes with faint dark cross bars; dorsal fin without dark spots; anal dusky.

DISTINCTIONS: The fish doctor is distinguished from the other pouts, except *Melanostigma*, by its lack of pelvic fins. It differs from *Melanostigma* in having small teeth in the jaws and in having the skin firmly attached. *Melanostigma* possesses larger teeth and the skin is loosely attached. Its fins are entirely soft-rayed.

SIZE: Up to a length of 22 cm.[496]

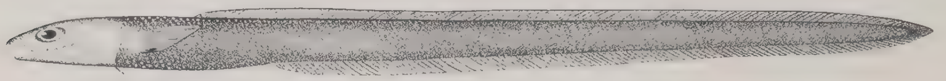
RANGE: Circumpolar, arctic and subarctic oceans. From Bristol Bay, Alaska, to Labrador and the Gulf of St. Lawrence; Greenland; Barents, Kara, and White seas; coast of Siberia.

Canadian distribution: Found at Goulburn Point, Bathurst Inlet, N.W.T., lat 70°13′N, long 140°15′W (from a sculpin stomach; identified by Frits Johansen);[517] Alert, Ellesmere Island, N.W.T.;[517] found in Fox Basin at lat 66°30′N, long 80°00′W; at the entrance to Fury and Hecla Strait and at Cobourg Island, Baffin Bay.[191] Several specimens from cod stomachs at Port Burwell and Gyrfalcon Islands, Ungava Bay.[124, 496] From the Labrador coast at Cape Mugford, lat 57°45′N;[191] at Cullingham's Cove, Hamilton Inlet;[210] at Domino Harbour, lat 53°30′N.[25] There is a single record from the Gulf of St. Lawrence, off Portneuf, P.Q.[514]

Common wolf eel **Lycode commune**

Lycenchelys paxillus (Goode and Bean) 1879

DESCRIPTION: Body very elongate, depth 18–20 in total length, cylindrical and tapering to tail. Head 7⅕–8 in total length, broad and flat above, upper profile steep, 4 pores on sides; mouth terminal, lower jaw included, angle under eye, single series of stout, sharp, recurved teeth in each jaw, a few teeth on vomer and a single series on the palatines. Eye 4 in head. Fins: dorsal (1) about 116, rays short, uniform, about 11 in head, fin originates over tip of pectoral and extends along back and is continuous with caudal; caudal indistinguishable from dorsal and anal, pointed; anal 105, rays very slightly longer than those of dorsal, fin originates about length of pectoral fin behind tip of same and extends to and is continuous with caudal; pectorals moderately large, rays about 2 in head, rounded, bases a short distance behind gill opening; pelvics small, rays about 8 in head, located ventrally under gill opening and well in front of base of pectorals. Lateral line faint and short. Small scales cover body and much of vertical fins.



Colour, light brown, the head somewhat darker.

DISTINCTIONS: The common wolf eel differs from the wolf eelpout in having a greater number of dorsal and anal fin rays (about 116 dorsal and 105 anal rays as against 92 and 88, respectively); the common wolf eel is more rounded in cross-section than the other species and the scales cover the body and vertical fins more completely than in the wolf eelpout. The body colour is uniform, not blotched as in the other species.

SIZE: Up to 14¾ inches long.[170]

RANGE: Found in deep water in the western North Atlantic Ocean from off Nova Scotia to lat 35°N in 200–900 fathoms.

Canadian distribution: The first known specimen was caught by the vessel *Marion* offshore between LaHave and Sable Island banks at lat 42°48′N, long 63°07′W.[170]. This appears to be the sole Canadian record, although the fish is probably not uncommon in the deep gullies between banks.[513]

Sars' wolf eel **Lycode de Sars**

Lycenchelys sarsi (Collett) 1871

DESCRIPTION: Body elongate, eel-like, greatest depth 17–19 in total length, occurring at vent, slightly compressed anteriorly, becoming quite compressed in tail region; body tapers gradually from the vent to a rounded tail. Head 7–7⅓ in total length, broad, snout blunt, upper jaw much longer than lower one; mouth terminal, angle under anterior part of eye. Eye moderate, 6 in head. Fins: dorsal (1) about 123, low, beginning over posterior end of pectoral fins, continuous with caudal, from which it is not distinguishable; anal about 117, slightly higher than dorsal, beginning behind vent or ⅓ of head length behind end of pectoral, and continuous with caudal; pectorals moderately large, length 1¾ in head length, end rounded, base immediately behind gill opening; pelvics very small, located ventrally, ahead of base of pectorals. About 7 lateral line pits under upper jaw and under eye; on the body the lateral line is ventral and indistinct. Body covered with scales, as are the bases of the dorsal and anal fins.

Colour, of older individuals uniformly yellowish-brown with indistinct shadings on the sides; small specimens grayish-brown on back and yellowish-white on underside; medium-sized specimens similar with irregular brown to black cross-markings on back and tail.

DISTINCTIONS: This species is closely related to the common wolf eel (*L. paxillus*). It has slightly higher numbers of dorsal and anal fin rays, there being 123 dorsal and 117 anal rays, as compared to 116 dorsal and 105 anal rays in *L. paxillus*.

SIZE: Up to a length of 7¼ inches.[216]

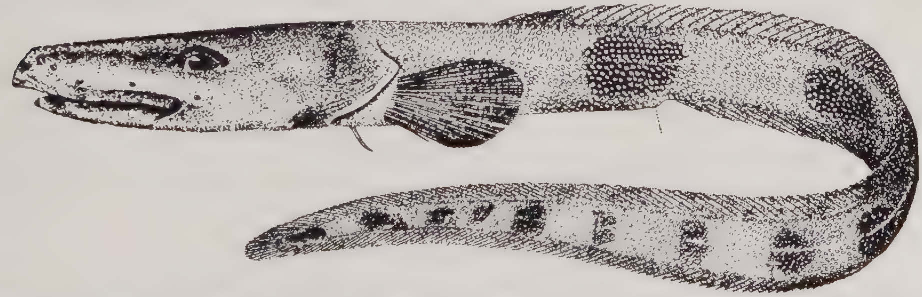
RANGE: On both sides of the North Atlantic Ocean. Grand Bank of Newfoundland. Off northern Norway; western part of Murman coast in 125–165 fathoms. The type form of the species is also known from southern Norway and the Skagerak.

Canadian distribution: Taken once by the M.V. *Blue Foam* in June 1951 on the southeastern edge of the Grand Bank at lat 44°06′N, long 49°05′W, in 95–300 fathoms.[6]

Wolf eelpout **Lycode à tête longue**

Lycenchelys verrilli (Goode and Bean) 1877

DESCRIPTION: Body elongate, depth about 18 in total length, gradually tapering near the tail. Head 7 in total length, except in old males in which it may become much enlarged and elongated to as much as 4½ in total length, much depressed, profile in front of eye rather steep, mouth terminal, lower jaw included, angle under or behind eye, depending on head length, 2 rows of uniform teeth in lower jaw, 1 row in upper jaw, teeth on vomer and palatines, 6 large pores on side of upper jaw and 7 on lower jaw. Eye 6 in head, more in old males. Fins: dorsal (1) about 92, rays about 12 in head, uniform, fin originates over or slightly behind tip of pectoral, extending to and continuous with caudal; caudal tip rounded; anal about 88, rays uniform and a trifle longer than those of dorsal, fin originates slightly less than length of head behind origin of dorsal and is continuous with the caudal; pectoral moderately large, end rounded, rays 1½ in head, base low on side, a very short distance behind gill opening; pelvics small, rays 6 in head, located ventrally under gill opening and slightly in front of pectorals. Lateral line single, median. Body covered with widely separated, deeply embedded scales, that are most numerous on the uppr part of the body and along base of dorsal fin.



Colour, light grayish-brown above the lateral line; pearly-white below it; belly blue. Sides with 8–10 irregular dark-brown patches, through which the lateral line cuts; a brown spot near tip of tail.

DISTINCTIONS: The wolf eelpout differs from the ocean pout in having all the dorsal rays soft and in having no apparent gap between the dorsal and the caudal fins; the dorsal fin originates over or behind the tip of the pectoral in the wolf eelpout, whereas in the ocean pout, it originates farther forward, over the base of the pectoral. It differs from the members of the genus *Lycodes* in being extremely slender, the depth being 16–18 in the total length as against 12 or less in *Lycodes*. *Lycenchelys paxillus* has more dorsal and anal fin rays (118 and 110) than *L. verrilli* (92 and 88).

SIZE: The maximum length is about 10 inches, but it is rarely over 6 inches long.

RANGE: Atlantic coast of North America from southern Newfoundland to deep water off North Carolina.

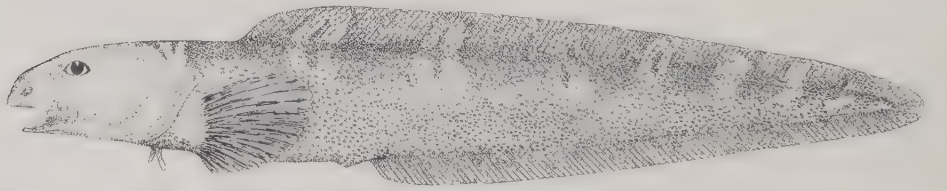
Canadian distribution: There are rather few records of this species. It has been caught in considerable numbers in Hermitage Bay on the south coast of Newfoundland in 1953–55.[10] A specimen, that is illustrated in Goode and Bean,[170] is recorded as having been taken 27 miles off Chebucto (i.e. Halifax Harbour), Nova Scotia. Five specimens were reported taken by the United States Fish Commission vessel *Speedwell,* 3 miles off Cape Negro, N.S., in the summer of 1877, in 90 fathoms.[170] The species is reported from "fishing banks off the coast" of Nova Scotia.[232] A few specimens were trawled off the mouth of Passamaquoddy Bay, N.B., in April and May 1919, in 35–50 fathoms.[205]

BIOLOGY AND ECONOMICS: The wolf eelpout is a bottom fish that is found on mud or sand at depths of from 25 to 600 fathoms.[49]

Esmark's eelpout **Lycode d'Esmark**

Lycodes esmarki Collett 1875

DESCRIPTION: Body moderately elongate, slightly compressed, depth 8 in total length, distance from vent to tip of tail more than 57% of total length. Head 4½ in total length, upper jaw projecting, angle of mouth under posterior edge of eye; lower jaw with 2 series of teeth, upper jaw with a single series, about 7 teeth on vomer and a single row of about 7 on each palatine, teeth are obtusely conic, not curved. Eye 9 in head. Fins: dorsal (1) 110–116, beginning over middle of pectoral and continuous with caudal, rays 3½ in head; anal 95, begins behind vent, almost a head length behind the beginning of the dorsal and is continuous with caudal, lower than dorsal; pectoral 22, longest rays slightly more than ½ head length, base low on side behind gill opening; pelvics small situated ventrally in front of pectorals. Lateral line indistinct, divided into median and ventral branches. Sides, back, belly, dorsal fin, and anterior part of anal fin covered with scales.



Colour, yellowish-white on belly and on lower surface of head. Back and sides brownish with 5–9 transverse bands of whitish-yellow on back and a narrow band on nape. These bands become broken into annular spots with age and may finally take the form of festoons.

DISTINCTIONS: *Lycodes esmarki* belongs to the long-tailed group of this genus, in which the distance from the vent to the tip of the tail is at least 57% of the total length, and there are scales on the belly. These characters separate it from *L. turneri, L. lavalaei*, and *L. reticulatus*, in which this length is less than 55% of the total length and the belly is scaleless. Its divided lateral line differentiates it from *L. vahlii.*

SIZE: Up to 25 inches in length.[170]

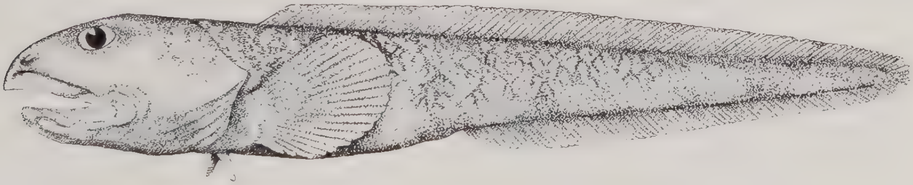
RANGE: Bear Island; Finmark; Spitzbergen; Grand Bank; La Have Bank.[234 515]

Canadian distribution: Two specimens were reported many years ago; one was caught on LaHave Bank at lat 42°43′N and between long 62°20′ and 62°30′W in 300–400 fathoms; the other was from the Grand Bank.[170, 515]

Laval's eelpout **Lycode de Laval**

Lycodes lavalaei Vladykov and Tremblay 1936

DESCRIPTION: Body elongate, greatest depth 6⅓ in total length, occurring at base of pectoral fin; distance from vent to tip of tail not over 55% of total length. Head about 4 in total length, upper jaw projecting; mouth terminal, angle before eye, conical teeth on jaws, vomer and palatines, mostly in a single series. Eye small, about 7 in head, situated high on head. Fins: dorsal (1) 95, longest rays 5½ in head, fin begins over base of pectoral and extends to tip of tail, being indistinguishable from the caudal; anal 74–77, begins immediately behind vent and continues to tip of body, likewise not distinguishable from caudal; pectorals moderately large, in a 21½-inch specimen the fin equals 16.8% of the body length, rounded, base low on side behind gill slit; pelvics small, located ventrally in front of bases of pectorals. Lateral line single, in median position. Scales variable in size, more developed in larger specimens, where they cover the entire sides from the beginning of the dorsal fin to the end of the caudal; about ⅓ of the posterior part of the dorsal and anal fins is completely covered with scales but on the anterior part of these fins the scales cover only the lower ¾ of the fin; back, belly, and base of pectoral fins without scales; younger specimens may lack the scales on the anal fin.



Colour, variable with size. In young individuals there is a narrow light band on the nape. Behind this are 8 or 9 slightly wider light bands that extend to the top of the dorsal fin and down the sides, but not onto the anal fin; the dark bands between them are wider dorsally than on the sides; these bands are distributed fairly uniformly between the middle of the pectoral fin and the tip of the tail. In older fish, over 15 inches long, the dark bands become less distinct and may disappear as may the light band on the nape. The under surface of the head of young individuals is uniformly pale-yellow; the belly is yellowish or gray. "Basically the fish is brownish-gray to gray in colour, with irregular spots, blotches or reticulations of black."[25]

DISTINCTIONS: *Lycodes lavalaei* is one of the short-tailed species, the distance between the vent and the tip of the tail not exceeding 55% of the total length. It differs from *L. turneri* in having scales on the sides and from *L. reticulatus* in having them developed on the dorsal fin, where they are lacking in *L. reticulatus*. The number of rays in the dorsal and anal fins is higher than in *L. reticulatus*.

SIZE: Up to a length of 22 inches.[25]

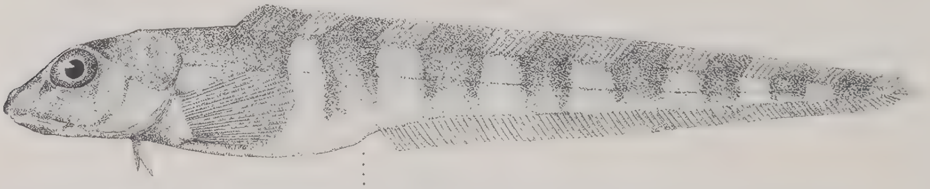
RANGE: This species is known only from the Labrador coast, the Gulf of St. Lawrence, eastern Newfoundland, and Banquereau.

Canadian distribution: Reported at various points on the Labrador coast, viz. Saglek Bay (lat 58°36′N), Nain (lat 56°31′N), Collinghams Cove, Hamilton Inlet, and Lake Melville (lat 54°01′N).[25] From off Bonavista Bay, Nfld.,[5] from an unidentified Newfoundland point.[515] From the Trois Pistoles, Que., region of the Gulf of St. Lawrence.[515] From Banquereau.[234]

Pale eelpout **Lycode pâle**

Lycodes pallidus Collett 1879

DESCRIPTION: Body moderately elongate, greatest depth 9 in total length, at beginning of dorsal fin, thence tapering uniformly to tip of tail, distance from vent to tail 54–62% of total length, making it one of the "long-tailed" eelpouts. Head large, 4–5 in total length, snout rather blunt, upper jaw projecting decidedly; angle of mouth under anterior edge of pupil of eye, conical teeth on jaws, vomer and palatines, mostly in a single series. Eye small, about 6 in head, located high on head. Fins: dorsal (1) 95–101,[25] longest rays 6 in head, forward part slightly lower, fin originates above middle of pectoral and is continuous with the caudal and anal; anal 79–86,[25, 217] about same height as dorsal, fin begins immediately behind vent and under 13th dorsal ray, continuous with caudal from which it is not distinguished; pectorals large, rounded, longest rays 1½ in head, base low on side and a short distance behind gill opening; pelvics small, 7 in head, located ventrally ahead of base of pectorals. Lateral line double, ventral and mediolateral branches usually only distinct between head and vent. In adult specimens the scales extend from the base of the pectoral fins to the end of the tail but the forward part of the back and much of the belly are scaleless; usually no scales on unpaired fins.



Colour, of large specimens uniformly brownish, somewhat darkened on the belly, on the posterior border of the gill covers, and on the posterior part of the anal fin. Small specimens have dark cross-bands on the back and sides and on the dorsal fin; as these bands disappear with age the last to remain are those on the dorsal fin.[217]

DISTINCTIONS: The pale eelpout belongs to the "long-tailed" group along with Vahl's and Esmark's. It has a double lateral line, whereas Vahl's has a single one. Esmark's has scales on the belly, which are lacking on the pale eelpout.

SIZE: Up to a length of 8¾ inches.[172]

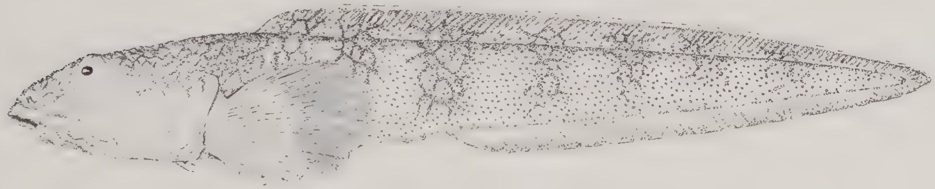
RANGE: It is a distinctly arctic species. Known from the Canadian Arctic Ocean and Labrador. Also from East Greenland, south of Jan Mayen, north and northeast of Iceland, north of the Faroes, west off southern Norway, off Spitzbergen and Franz Joseph Land, in the European Arctic Sea and the Kara Sea; in depths of 6–950 fathoms.[217]

Canadian distribution: A few small specimens were collected at Mould Bay, Prince Patrick Island, N.W.T., in July 1952, in 16–22 fathoms.[517] Eight specimens were collected in Hebron Fjord, Labrador (lat 58°09′N), in the summers of 1949 and 1954.[25, 172]

Arctic eelpout **Lycode arctique**

Lycodes reticulatus Reinhardt 1838

DESCRIPTION: Body moderately elongate, greatest depth 7–8 in total length at beginning of dorsal fin, thence tapering uniformly to tip of tail; distance from vent to tip of tail less than 55% of total length, making it one of the so-called "short-tailed" *Lycodes*. Head large, 4⅓ in total length, snout rather blunt, upper jaw projecting decidedly, angle of mouth behind posterior edge of eye, conical teeth on jaws, vomer, and palatines, mostly in a single series. Eye small, about 10 in head, located high on head. Fins: dorsal (1) 81–88,[515] longest rays about 6 in head, near beginning of fin, somewhat shorter posteriorly, fin begins over middle of pectoral and continues without interruption to tip of tail, not being distinguishable from caudal; anal 68–70, rays similar in length to those of dorsal, fin begins behind vent or almost a head length behind origin of dorsal, and continues to end of tail, being indistinguishable from the caudal; pectorals large, rounded, longest rays 2 in head, base covers lower half of side, immediately behind gill opening; pelvics small, ventral, situated in front of base of pectorals. Lateral line single, median in position, not very prominent. Body partially covered with scales, more so in larger specimens, where sides are scale-covered from below beginning of dorsal fin almost to end of tail; no scales on dorsal fin, nor on back or belly.



Colour, variable, both with size and locality. General colour brownish with 8–10 dark bands running vertically on the upper part of the body, these being narrower than the light spaces which they separate. These light spaces extend to the top of the dorsal fin but disappear on the lower part of the body. There is a light band on the nape in this species at all ages.

DISTINCTIONS: In its own genus (*Lycodes*) the arctic eelpout is distinguished by being "short-tailed," i.e. the length from the vent to the tip of the tail is not over 55% of the total length. Associated with this, the number of dorsal fin rays is under 90. The presence of scales on the sides separates it from *L. turneri* and the absence of scales on the dorsal fin separates it from *L. lavalaei,* which has scales on the fin.

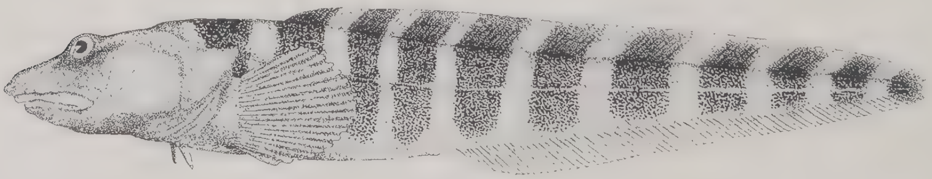
RANGE: On both sides of the northern Atlantic. It occurs as far south as Nova Scotia and was reported once from Vineyard Sound, Massachusetts.[170, 456]

Canadian distribution: Reported from two stations in mid Hudson Bay, one towards the eastern and one towards the western side.[196] Found in Ungava Bay.[124] Found on the Labrador Coast where it had been reported earlier off Cape Harrison (about lat 55°N).[241] More recently it was collected at Goose Bay, Lake Melville (lat 53°22′N) in 29 fathoms, August 1951; at Kaipokok Fjord (lat 55°05′N) in 45 fathoms, August 1949, and in Hebron Fjord (lat 58°09′N) in August 1949.[25] It was found again in Hebron Fjord in July 1954.[172] It was recorded on the Labrador Coast, without specific locality.[191] Also reported from off Domino Point, Labrador.[19] Taken in the Strait of Belle Isle;[18] in Conception and Placentia bays, Nfld.[17, 19] and on the mid-northern part of the Grand Bank.[20] Taken frequently in the Trois Pistoles, Que., region from Trois Pistoles to Metis, Que.[357, 515] Taken off the coast of Nova Scotia in depths of about 50 fathoms.[513]

Polar eelpout **Lycode polaire**

Lycodes turneri Bean 1878

DESCRIPTION: Body elongate, depth 7–8 in total length, occurring near base of pectoral fin; distance from vent to tip of tail less than 55% of total length. Head almost 4 in total length, depressed, upper jaw projecting, a toothless space at front of jaw but otherwise a series of slender, slightly recurved teeth on the jaws, a cluster of teeth on head of vomer and a short single series on the palatines. Eye diameter 9 in head, eye high on head. Fins: dorsal (1) 89–92[515] (Labrador specimens 82–87),[25] fin begins over middle of pectoral and continues to posterior tip of body, being indistinguishable from the caudal; anal 67–70[515] (Labrador specimens 64–71),[25] beginning immediately behind vent and slightly behind middle of body, extending to tip of tail and indistinguishable from caudal; pectorals large, rounded, longest rays 2¼ in head, base long extending along much of gill opening; pelvics small, situated ventrally in advance of pectorals. Body devoid of scales, except occasionally when scattered scales occur



on the sides only above the anterior part of the anal fin. Lateral line single, readily visible along middle of side to extremity of the tail.

Colour, variable with size. Lower sides dark. Younger specimens have conspicuous dark and light bars. Fish 3–4 inches long have 10–12 dark bands on a creamy-white background. These bands are distributed one between the nape and the beginning of the dorsal fin, 2 or 3 between the beginning of the dorsal and that of the anal; the others are on the tail. As the fish becomes larger the bands become irregular and broken and some may disappear, the fish becoming darker in colour. Belly yellowish-brown.

DISTINCTIONS: *Lycodes turneri* may be distinguished from the other species of this genus by the fact that the body is usually devoid of scales, or in exceptional cases has only a few scattered scales on the middle of the sides. Furthermore it has 10–12 whitish bands on the body and dorsal fin and a clear band on the nape in the young; in the adults there are zig-zag light spots on the sides and a band on the nape, the latter sometimes disappearing.

SIZE: Up to a length of 9½ inches.[515]

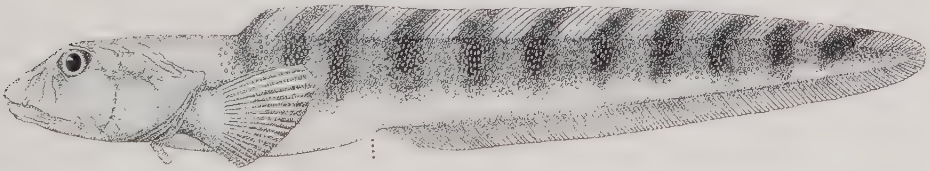
RANGE: Arctic Ocean, Labrador coast, northern Gulf of St. Lawrence; also reported in Bering Straits.

Canadian distribution: Recorded somewhat doubtfully for Bernard Harbour, N.W.T.[517] Taken frequently on the Labrador coast from Hamilton Inlet and Lake Melville north to Kangalaksiorvik Fjord (lat 59°25′N); many taken in Hebron Fjord in July 1954, in about 70 fathoms.[23, 25, 172] Taken in the neighbourhood of Trois Pistoles, Que., in the Gulf of St. Lawrence in August 1932 and 1935.[515]

Vahl's eelpout **Lycode de Vahl**

Lycodes vahlii Reinhardt 1838

DESCRIPTION: Body elongate, somewhat compressed, greatest depth 10 in total length, occurring about middle of pectoral fin, tapering gradually to tip of tail; tail portion long, distance from vent to tip of tail varies from 57 to 61% of total length, with average of 60%. Head 5 in total length (varies from 19–25% of total length), mouth terminal, upper jaw projecting, angle of mouth under middle of eye, conical teeth on jaws, vomer, and palatines. Eye about 7 in head, located high on head. Fins: dorsal (1) 104–112, rays about 6 in head, begins above middle of pectoral and continues to tip of tail, being indistinguishable from caudal; anal 92–97, beginning behind vent and continuing to tip of tail, indistinguishable from caudal; pectorals large, longest rays 2 in head, base a short distance behind gill opening and occupying lower half of side; pelvics small, located ventrally, in front of bases of pectorals.



Lateral line single and ventral in position, readily visible anteriorly but fading out about midway between vent and tip of tail. Back, sides, belly, and vertical fins covered with scales in fish 6 inches or over, but none on base of pectoral fins; young individuals lack scales on the tail region, while very young ones lack them on the back also; 28–29 horizontal rows of scales between the base of the dorsal and that of the anal fin.

Colour, light brownish-gray, striped with a variable number of vertical blackish bands that extend, in young individuals, from the sides of the dorsal to the sides of the anal fin; the number of bands varies from 7 to 12 and they are distributed from the middle of the pectoral fin to the tip of the tail. In larger specimens the number of stripes is less and they end above the base of the anal; in young specimens the dark and light bands are more sharply contrasted than in older fish. The first band always ends above the base of the pectoral fins.

DISTINCTIONS: Vahl's eelpout belongs to the "long-tailed" group, with the tail 57% or more of the total length; this separates it from the "short-tailed" group (*L. turneri*, *L. lavalaei*, and *L. reticulatus*). The single ventral lateral line distinguishes it from *L. esmarki* which has a double lateral line.

SIZE: Up to a length of 13 inches.[515]

RANGE: East coast of North America in the Gulf of St. Lawrence; Greenland; Iceland and Scandinavian coasts.

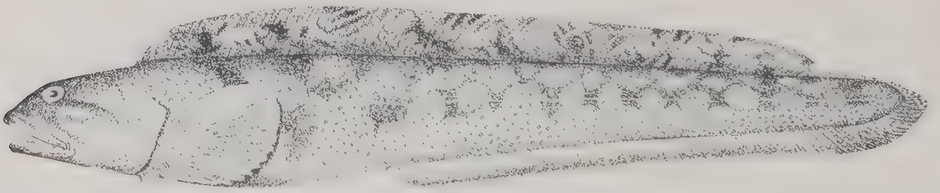
Canadian distribution: Moderately numerous in the Gulf of St. Lawrence off Trois Pistoles, Que.;[514, 515] taken off the mouth of the Saguenay River and frequently off Fox River, Que.[454]

Ocean pout **Loquette d'Amérique**

Macrozoarces americanus (Bloch and Schneider) 1801

OTHER COMMON NAMES: muttonfish, "conger eel," eelpout, mother-of-eels

DESCRIPTION: Body elongate, moderately compressed, greatest depth 7 in total length occurring at the tip of the pectoral fin, body then tapering, first rapidly and then gradually to the tail. Head 5½ in total length, broad, snout blunt, mouth terminal, large, lower jaw included, angle well behind eye, 2 series of strong, blunt, conic teeth in front of each jaw and one series on sides, no teeth on vomer or palatines. Eye small, 9 in head. Fins: dorsal (1) 95–100, XVIII, 17, height mostly uniform and about 2⅔ in head, first rays shorter and last 16–24 rays uniformly very short, making it appear superficially that there is a distinct gap between the dorsal and caudal fins, fin begins over posterior end of head and is continuous with the caudal through the short rays; caudal pointed, indistinguishable from dorsal and anal; anal 105–124, rays uniform in height and about 5 in head, fin begins a little ahead of mid-point of body and is continuous with the anal; pectorals large, rounded with scalloped edges, longest



rays about 1½ in head, base low on sides of body, immediately behind gill opening; pelvics small, 6 in head, located ventrally before base of pectorals. Lateral line straight. Scales small, skin very smooth, covered with mucus.

Colour, variable, ground colour usually some shade of muddy-yellow to reddish-brown, with mottlings of darker gray or olive-green, extending on dorsal fin; top of head darker than body, grading to lighter hues on cheeks, which are variously mottled; lips dull-yellow. Belly white to dull-yellow. Dorsal fin darker than anal, edged with yellow; pectorals often reddish or orange.[338]

Distinctions: The ocean pout is distinguished from other western Atlantic fishes by the heavy head, with thick lips and eyes high on the head, by the tapering elongate body, the pointed tail, the continuous dorsal, caudal, and anal fins, with a spinous portion near the tail in a predominantly soft dorsal fin. It is distinguished from the blennies by its predominantly soft dorsal rays; from the wrymouth by the soft dorsal rays and the presence of pelvic fins; from the wolffish by the more slender body, smaller teeth and pointed tail; from the wolf eelpout and species of *Lycodes* by the spinous portion in the posterior dorsal fin.

Size: Up to a length of about 3½ feet and a weight of 12 pounds, but specimens over 2½ feet in length are rare.[49]

Range: Western North Atlantic Ocean from near Battle Harbour, Labrador, to Delaware, possibly straying to North Carolina. Common from the southern Gulf of St. Lawrence to New Jersey. A related, but viviparous, species occurs on the coast of northern Europe.

Canadian distribution: Reported from St. Lewis Sound (lat 52°15′N) and Forteau Bay, Labrador.[25] Common in the Strait of Belle Isle at Raleigh, Nfld.[17, 209] In the Gulf of St. Lawrence it is reported from the Trois Pistoles and Baie Ste.-Catharine, P.Q. regions;[514] at Anticosti;[405] in Chaleur Bay;[183] in Miramichi Bay, N.B.[93, 312] at Tignish, P.E.I.;[92] at the Magdalen Islands and at Cheticamp, N.S.[95] From Bonavista Bay;[5] from Trinity and Conception bays and off Bay Bulls, Nfld., and from the Grand Bank.[17] Common off Canso, N.S.;[91] common on the coast of Nova Scotia and the offshore banks.[513] Common in the Bay of Fundy including Passamaquoddy Bay and Minas Basin.[81, 205]

Biology and Economics: The ocean pout is a bottom fish that occurs in a variety of depths from the intertidal zone to over 100 fathoms. It migrates into deeper water in autumn and returns to the shallower areas in the spring.[81] It is found on all kinds of bottom but is more numerous on hard and semi-hard bottom than on mud. It can tolerate temperatures from 31 to 62 F.

Unlike the viviparous European species, the North American ocean pout deposits its eggs.[524] The eggs are very large, about ¼ inch in diameter and yellow in colour. Each female produces from 1300 to 4200 eggs. They are laid in masses, held together by a gelatinous substance. They hatch in 2–3 months after deposition. Spawning occurs in the autumn.[81, 338]

Studies of ocean pout in the Bay of Fundy indicate slow growth, viz. a length of 12 inches at 5 years; 24 inches at 12–13 years; and 27–28½ inches at 16–18 years.[81] Growth in the Gulf of Maine is somewhat more rapid, a length of 24 inches being reached in 6–7 years.[338]

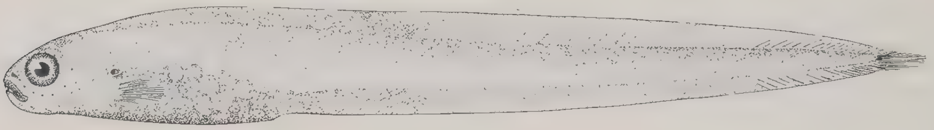
Ocean pout eat a wide variety of invertebrates and an occasional small fish, such as herring or smelt. Marine worms, sea urchins, brittle stars, sand dollars, crabs, shrimp, amphipods, barnacles, mussels, whelks, periwinkles, scallops, and sea squirts are included in the diet, as well as many other molluscs.

While quantities up to 4½ million pounds were landed annually in the United States during World War II, this soon dropped to a trifling amount through lack of demand at the end of the conflict.[49] The resource is not utilized in Canada.

Atlantic soft pout **Mollasse atlantique**

Melanostigma atlanticum Koefoed 1952

Description: Body elongate, greatest depth 9⅕ in total length, occurring just behind tip of pectoral fins; body tapering from there to tip of tail. Head 7⅗ in total length, blunt, somewhat compressed, snout rounded; mouth small, terminal, oblique, angle under front of eye, teeth in a single series in jaws, also on vomer and palatines, teeth elongate; gill opening reduced to a pore-like opening above base of pectoral fin. Eye large, 3¼ in head. Fins: dorsal (1) its origin, above the gill opening, enveloped in the loose skin of the body, longest rays about 4 in head, extending full length of body, its termination indistinguishable from the caudal; caudal small, pointed, not separable from dorsal and anal; anal about same height as dorsal, commencing about 2½ head lengths from the snout and continuing to the caudal; pectorals small, longest rays 2 in head, base on side of body below gill opening; pelvic fins absent. Body enveloped in a loose, moveable, delicate skin.



Colour, purplish-gray on upper part of body, sides similar, but almost black near tail; inside of mouth and gill openings black.

Distinctions: *Melanostigma* can be distinguished from most of the pouts by the absence of pelvic fins, a character that it shares with the fish doctor (*Gymnelis*). It differs from the latter in having a loosely attached skin. The teeth in the jaws are longer and the pectoral fins are smaller.

Size: Specimens up to 5½ inches in length have been reported.

Range: Gulf of St. Lawrence, south coast of Newfoundland, off the Grand Bank; taken frequently along the edge of the continental shelf off New Jersey and Delaware; also recorded in the South Atlantic Ocean from the Straits of Magellan and off South Georgia (same species?).

Canadian distribution: A 3¼ inch specimen was caught in 390 fathoms in Bay d'Espoir, Nfld., at lat 47°43′53″N, long 56°07′40″W in November 1954.[10] A specimen about 5½ inches long was caught in 250–300 fathoms off the southwestern edge of the Grand Bank at lat 43°14′N, long 51°19′W, in June 1956. Specimens from 2½ to 4¾ inches long were caught off Portneuf, Baie Comeau, P.Q. and adjacent points, and off Fox River, P.Q., in 1953–54.[454] McAllister and Rees[292] have published a revision of the genus *Melanostigma* and reviewed the Canadian distribution.

Suborder STROMATEOIDEA

This suborder consists of fishes in which the oesophagus has lateral expansions or sacs that are often equipped internally with teeth.

Family STROMATEIDAE — Butterfishes

This is a large family of moderately laterally compressed and deep-bodied marine fishes. The dorsal fin is long and usually divided into soft and spiny-rayed sections, caudal usually forked, anal with three spines, pelvic fins, when present, composed of one spine and five soft rays and attached by a thin membrane to the abdomen.

Three species have been reported from our area.

KEY to Family STROMATEIDAE

1 Pelvic fins absent .... Butterfish, *Poronotus triacanthus* (p. 332)
Pelvic fins present 2

2 Spinous dorsal fin low, of 6–8 uniformly short spines; pelvic fins inserted behind pectoral fin base ...... American barrelfish, *Palinurichthys perciformis* (p. 330)
Spinous dorsal fin triangular, of 10 or 11 spines; pelvic fins inserted under, or in advance of, pectoral fin base ...... Man-of-war fish, *Nomeus gronowi* (p. 329)

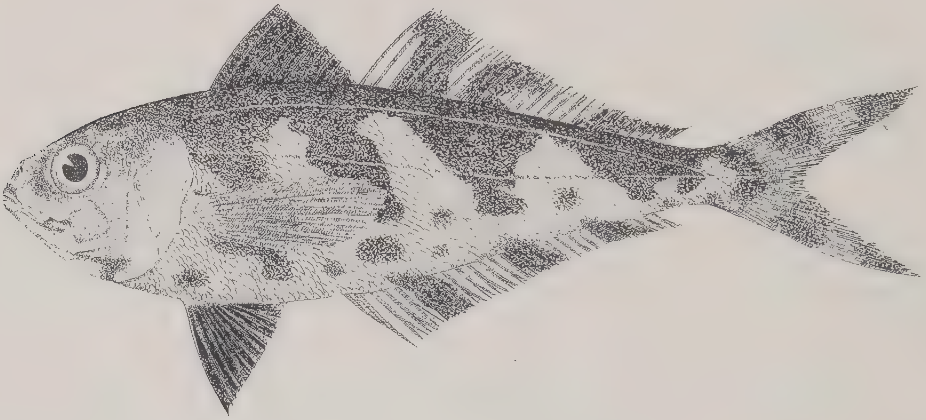
Man-of-war fish — Physalier

Nomeus gronowi (Gmelin) 1788

OTHER COMMON NAMES: blue-bottle fish

DESCRIPTION: Body oblong, much compressed, greatest depth 4½ in total length, occurring at origin of first dorsal, outline thence to caudal peduncle slightly convex. Head almost 6 in total length, bluntly rounded, compressed; mouth terminal, small, somewhat oblique, angle under front of eye, small teeth in a single series in jaws, teeth on vomer and palatines. Eye large, almost 3 in head. Fins: dorsals (2) 1st X–XI, triangular, first rays 1½ in head, base equal to head length, origin a short distance behind perpendicular through gill opening, 2nd dorsal I, 24–26, almost triangular, first rays 1½ in head, base twice length of head, no space between it and 1st dorsal, fin ends on caudal peduncle; caudal large, very deeply forked; anal III, 24–27, almost a replica of 2nd dorsal, under which it is situated, rays slightly shorter; pectorals large, oblong, rounded, almost twice length of head, base somewhat behind gill opening; pelvics large, fan-shaped, rays slightly shorter than head, base ventral to and slightly before base of pectorals, can be depressed into a groove. Lateral line indistinct, placed high on side. Scales moderate.

Colour, variable, upper surface dark blue to black, sides silvery to milky-white with 3 or 4 extensions of dark colour through them; pelvic fins completely blackish or edged with black; caudal fin with dark, continuous extensions or blotches.



DISTINCTIONS: Although resembling the mackerels anatomically the man-of-war fish lacks finlets. Its fan-like pelvic fins and very deeply forked tail separate it from the pompanos and jacks, which it superficially resembles.

SIZE: Up to a length of 6¼ inches.

RANGE: The man-of-war fish is said to be one of the most abundant pelagic fishes in the tropical Atlantic and Indian oceans. It abounds in the Sargasso Sea and reaches the Bermudas. It is often associated with the Portuguese man-o'-war and other large jellyfish.[170] Frequent on the coast of South Africa.[434] Taken once near the Grand Bank.

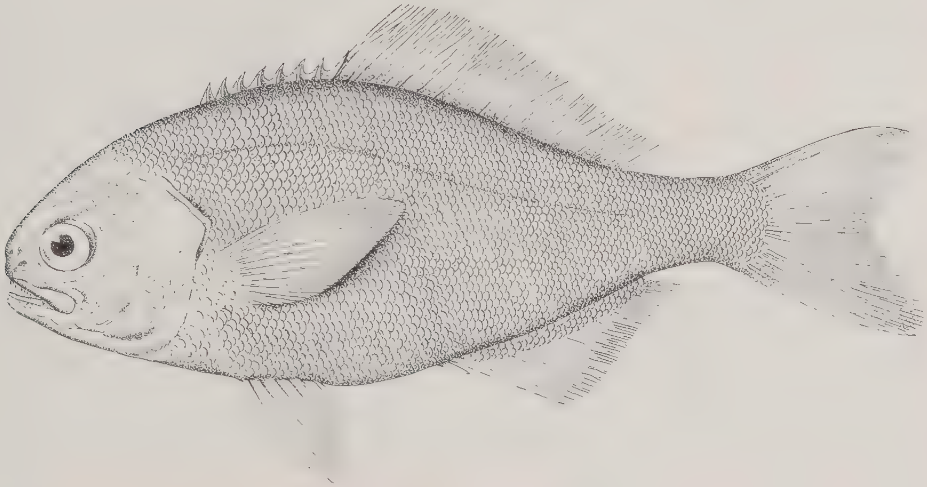
Canadian distribution: One specimen was caught in deep water slightly southeast of the Grand Bank (lat 47°00′N, long 45°00′W) in July 1952. It is doubtfully referred to this species of *Nomeus*.[7]

American barrelfish **Pompile d'Amérique**

Palinurichthys perciformis (Mitchill) 1818

OTHER COMMON NAMES: rudderfish, black pilot, logfish

DESCRIPTION: Body stout, oblong, moderately compressed, greatest depth at beginning of soft part of dorsal, being 3 in total length; caudal peduncle stout. Head short, 4½ in total length, profile very blunt; mouth terminal, angle of mouth under posterior edge of pupil of eye, one series of small, slender teeth in each jaw; preoperculum, and suboperculum slightly serrate. Eye 4 in head. Fins: dorsal (1) VI–VIII, 20–22, the spines short, uniform, less than ½ diameter of eye in length, first spines almost separate, soft portion of fin much higher, length of rays ½ head length, decreasing somewhat posteriorly, fin begins just behind level of gill opening and ends at beginning of caudal peduncle; caudal large, slightly forked; anal III, 15–17,[322] spines short, the first 2 almost embedded in skin, soft rays about equal to corresponding ones in dorsal, fin begins under 6th soft dorsal ray and ends a trifle behind the dorsal; pectorals moderately large, length equals ⅚ of head length, located a little below middle of side and a short distance behind gill opening; pelvics large, triangular, ⅔ of head length, located ventrally under base of pectorals. Scales small, covering body, much of sides of head, and base of vertical fins. Lateral line high on body.



Colour, blackish-green all over, sometimes paler on belly; belly mottled with darker dots and bars.

Distinctions: The barrelfish can be distinguished readily from the cunner, tautog, and other spiny-rayed fish that it resembles by the shortness of the dorsal spines. The pilot fish, which has even less pronounced dorsal spines, has a deeply forked tail while that of the barrelfish is only slightly forked.

Size: Up to a length of 14 inches.

Range: Possibly bathypelagic in the North Atlantic Ocean.[322] Has been recorded offshore on the southwestern edge of the Grand Bank and in inshore waters from Halifax, N.S., to off Key West, Florida;[447] most common off Massachusetts. Recorded once in the English Channel—possibly adrift with debris from North America. (See F. J. Schwartz, Chesapeake Science, 1963.)

Canadian distribution: Recorded in 1952 from the southwestern edge of the Grand Bank at lat 44°08′N, long 52°44′W.[7] Two specimens were obtained in Halifax Harbour and its approaches in 1927 and 1934.[498] Another was caught in 1885 on LaHave Bank at lat 43°10′N, long 64°15′W; it is preserved in the United States National Museum.[322]

BIOLOGY AND ECONOMICS: The barrelfish is found associated with drifting seaweed and other debris and has been found only from June to November from Cape Cod northward.

The large eyes, dark colour, and immaturity of most specimens have given rise to the idea that the mature individuals are bathypelagic and that only the younger ones stray into coastal waters.[322]

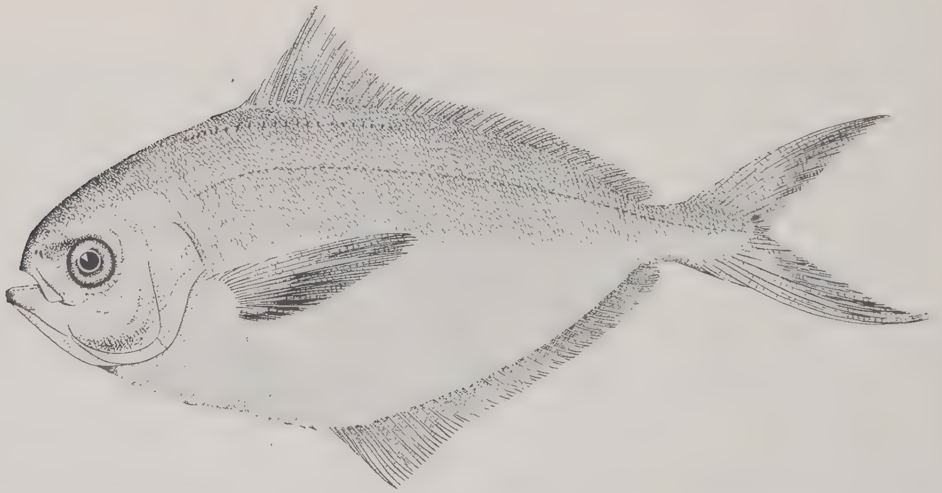
It feeds on small crustaceans, small squid, and other molluscs, as well as on fish fry.

Butterfish — Stromatée à fossettes

Poronotus triacanthus (Peck) 1800

OTHER COMMON NAMES: dollarfish, shiner, harvest-fish

DESCRIPTION: Body ovate, strongly compressed, greatest depth under first part of dorsal fin, being 2¾ in total length; caudal peduncle small. Head short, 4¾ in total length, blunt, compressed, profile obtuse; mouth small, terminal, lower jaw projecting, angle of mouth in front of eye, a single series of weak teeth in each jaw. Eye large, 4 in head. Fins: dorsal (1) III, 45, spines short and weak, the first one directed forward, first part of fin increasing in height (to about ⅓ of body depth) and rapidly falling off to a lower, uniform, posterior portion, fin originates a little behind base of pectoral and ends on caudal peduncle; caudal large, very deeply forked, its length 5/7 of greatest depth of body; anal III, 38, spines very short, lying down, the first directed forward, fin narrows evenly from front to rear, not quite as long as dorsal but ending under its tip; pectorals large, length equals ⅔ of greatest body depth, base a little below middle of side and a short distance behind gill opening, fin directed slightly upward; pelvics, none. Scales small, loosely inserted, covering body, part of head and part of dorsal, anal, and caudal fins. Lateral line high on side. A series of well-marked pores under forward part of dorsal fin, well above lateral line.



Colour, leaden-bluish above, paler on sides; belly silvery.

DISTINCTIONS: Members of the butterfish family are deep-bodied, much compressed fishes with long, soft dorsal and anal fins (with a few weak spines preceding them), with deeply forked caudal fins, and small mouths. Some species lack pelvic fins. Fishes that resemble them in general form, such as scup, triggerfishes, etc., have strong dorsal spines; moonfish have pelvic fins. The closest relative of the butterfish, the harvest-fish (*Peprilus alepidotus*), with much higher lobes on dorsal and anal fins, has not been found north of the Gulf of Maine.

SIZE: Up to a length of 12 inches and a weight of $1\frac{1}{4}$ pounds; usually not over 9 inches long.

RANGE: Atlantic coast of North America from off South Carolina to the Gulf of St. Lawrence and the south and east coasts of Newfoundland.

Canadian distribution: In the Gulf of St. Lawrence only sparingly; at Point St. Pierre, Gaspé;[130] not uncommon in the Miramichi estuary;[312] at Malpeque Bay, P.E.I.;[333] near Margaree Harbour, N.S.[193] On the south and east coasts of Newfoundland at Rose Blanche and Bay Bulls;[17, 18] on the southwestern edge of Grand Bank at lat 44°40′N, long 53°38′W, in 60–80 fathoms.[8] Reported from the outer coast of Nova Scotia at Canso;[01] abundant sporadically at Halifax, N.S.;[304] St. Margaret's Bay; coast of Yarmouth County.[205] In the Bay of Fundy and St. Mary Bay generally, going into Passamaquoddy Bay and Minas Basin, but not often abundant.[205]

BIOLOGY AND ECONOMICS: Small schools of butterfish frequent sandy bottom during the period of warmer water from May to November. In winter they are found in depths up to 100 fathoms.

They eat small fishes, amphipods, shrimp, and marine worms.

Little is known of their breeding habits in Canada; spawning fish have been caught in St. Mary Bay in July.[205] It is not known whether they breed successfully in Canadian waters, as neither fry nor fish smaller than $2\frac{3}{4}$ inches have been caught.

Spawning in the Gulf of Maine is from June to August. The eggs float, are about $\frac{1}{30}$ inch in diameter, and with a small oil globule. They hatch in 2 days at 65 F. Young butterfish 2 inches long often live among the tentacles of the red jellyfish, *Cyanea*. Butterfish 7 inches long are 2 years old.[49]

Butterfish are caught in weirs, traps, and otter trawls so rarely that they have no commercial importance in Canada, although a few were canned at St. Mary Bay, N.S., many years ago. Two Halifax Harbour traps caught 15,000 pounds in one day in November 1938 but this is unusual.[304] Landings in Massachusetts range from 300,000 to 2,250,000 pounds annually.[49] They are a delicious pan fish.

Suborder MUGILOIDEA

In this suborder the pelvics are subabdominal and have one spine and five soft rays, the pectoral fins are elevated on the sides and the spiny and soft-rayed dorsal fins are widely separated. The suborder contains three families, Sphyraenidae, Mugilidae, and Atherinidae, but sometimes a fourth family is included, the Polynemidae.

Only the Mugilidae and Atherinidae occur in the Canadian area.

KEY to Species of Suborder MUGILOIDEA

Anal fin long, of 22–25 rays, with one weak spine commencing under first (spiny) dorsal fin; body slender and elongate .... Atlantic silverside, *Menidia menidia* (p. 335)

Anal fin short, of 7 or 8 rays, preceded by 3 strong spines; anal fin commencing under origin of 2nd (soft) dorsal fin; body stout .... Striped mullet, *Mugil cephalus* (p. 334)

Family MUGILIDAE Mullets

These are moderate-sized fishes occurring in warm, coastal, marine waters, or in fresh waters. The body is elongate and rather stout; scales large, cycloid, lateral line absent; first dorsal fin of four stiff spines, the fourth reduced; second dorsal fin longer than first; anal fin spines two or three; pelvic fins abdominal or subabdominal, of one spine and five soft rays; air bladder large, peritoneum usually black.

The various species feed on minute organisms found in the bottom mud or ooze.

Many species are of commercial importance but only one species strays into our area.

Striped mullet Muge cabot

Mugil cephalus Linnaeus 1758

OTHER COMMON NAMES: common mullet, mullet

DESCRIPTION: Body stout, somewhat compressed, depth $4\frac{3}{4}$ in total length; caudal peduncle stout. Head about 5 in total length; snout blunt; mouth terminal, small, its angle well before front of eye; small, close-set teeth in jaws. Eye moderate, $5\frac{1}{2}$ in head, partially covered by adipose eyelid. Fins: dorsals (2), 1st IV, spinous, height 2 in head, situated nearer to snout than to caudal peduncle, 2nd dorsal, I, 8, second ray equal to longest part of 1st dorsal, distance between 1st and 2nd dorsals about equal to their height; caudal large, moderately forked; anal III, 7–8, longest rays a trifle longer than those of dorsals, its origin slightly in front of that of 2nd dorsal, longer than 2nd dorsal; pectorals on sides behind gill opening, $1\frac{3}{4}$ in head length; pelvics abdominal, situated on ventral edge, under posterior $\frac{1}{3}$ of pectoral, almost as long as pectoral. Lateral line not prominent. Scales cycloid, large, rounded, covering body and much of head.

Colour, dark bluish above; sides silvery; side scales with dark centres, giving appearance of a series of dark, horizontal stripes.

DISTINCTIONS: The mullet can be distinguished from the Atlantic silverside by its heavier, deeper body (depth $4\frac{3}{4}$ as compared to $7\frac{1}{2}$ in the silverside); the anal fin is much shorter than that of the silverside, and its origin is far behind the first dorsal fin, instead of under it as in the silverside. It lacks any silvery stripe on the side; this stripe is characteristic of the silverside. The two dorsal fins of the mullet are similar in size; the spinous one is much the smaller in the silverside.

SIZE: Up to a length of 2½ feet.

RANGE: On both sides of the North Atlantic. From Maine to Brazil, straying to Nova Scotia; rare north of Cape Cod. Occurs on the coast of southern Europe and northern Africa. Also found on the Pacific coast of the Americas from Monterey, California, to Chile.

Canadian distribution: Only one Canadian record exists. A 3-inch (77-mm) mullet, doubtless a stray, was taken in a seine haul in Bedford Basin, Halifax Harbour, Nova Scotia, on September 29, 1931.[498]

Family ATHERINIDAE Silversides

The silversides are small, slender, silvery fishes, often occurring in large schools in shore waters of warm and temperate seas, and also in fresh waters. An air bladder is present and the peritoneum is usually silvery. Most species are carnivorous.

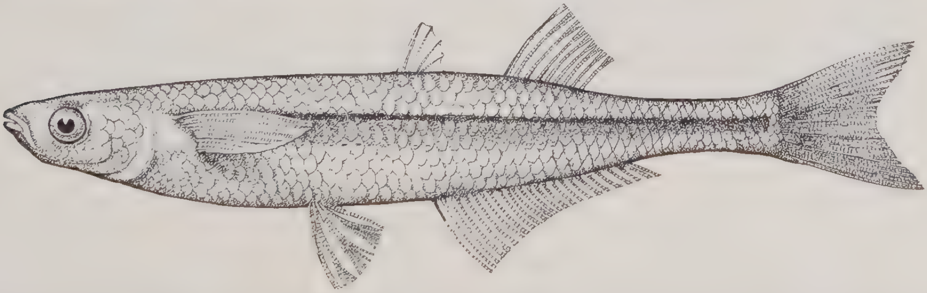
Only one species occurs in our area.

Atlantic silverside **Capucette**

Menidia menidia (Linnaeus) 1766

OTHER COMMON NAMES: sand smelt, capelin (erroneously)

DESCRIPTION: Body slender, belly rounded, depth 7½ in total length; caudal peduncle slender. Head 5½ in total length, somewhat compressed; mouth terminal, small, oblique, its angle well before eye, each jaw with a band of slender teeth. Eye 4 in head, 1¼ times its own diameter from snout. Fins: dorsals (2), 1st spinous, III–VII, origin slightly in front of middle of body, longest rays 3½ in head, 2nd dorsal, 7–10, almost twice height of 1st dorsal, about length of its own base behind 1st dorsal; caudal large, moderately forked; anal, I, 22–25, beginning under middle of 1st dorsal, its base 2½ times base of 2nd dorsal, ending behind perpendicular through end of 2nd dorsal; pectorals inserted high on sides, behind gill opening, ⅘ length of head, bluntly pointed; pelvics inserted on ventral edge of body under tips of pectorals, end truncated, ½ length of head. Lateral line evident. Scales moderate, cycloid, covering body and head behind eye.



Colour, transparent-green above; belly white; a silver band, edged above with a narrow black streak, runs from upper part of base of pectoral to base of caudal. Each scale outlined with a series of brownish or greenish dots.

Distinctions: The silverside is distinguished from the smelt, capelin, and herrings by having two dorsal fins, the first spinous. There is no adipose fin. The long anal fin and the silver stripe on the sides are characteristic.

Size: Up to 5½ inches in length.

Range: Confined to shore waters and estuaries from the southern Gulf of St. Lawrence to Cape May. Distinction is frequently made between the northern form (*M. m. notata*) and the southern (*M. m. menidia*) but these intergrade.[49]

Canadian distribution: The most northerly records are from Bay St. Lawrence, N.S., Magdalen Islands, P.Q., and the Miramichi estuary.[95, 312] Very abundant in Malpeque Bay, P.E.I., and elsewhere around Prince Edward Island in the inlets.[334] Not definitely reported but probably occurs on the outer coast of Nova Scotia in estuaries. Found in estuaries and brackish water in the Bay of Fundy and St. Mary Bay; at Deer Island, Kennebecasis Bay, and Annapolis Basin.[205] Very abundant in Minas Basin and the young are found far up the tidal portion of the Shubenacadie River.[64]

Biology and Economics: The Atlantic silversides occur in large schools close to shore and in brackish water. Many of them remain there in winter as they are caught through the ice.[334] However, some have been caught in 27 fathoms of water in Chesapeake Bay in winter.[192]

They spawn in June in the southern Gulf of St. Lawrence.[334] The eggs are about $\frac{1}{20}$ inch in diameter, spherical, and each has a group of sticky filaments They adhere in groups to sand and weed and hatch in about 10 days in the moderately warm water of the area.

Most silversides are 1 year old and about 2–3½ inches long; less abundant, larger ones are least 2 years old.

The adult silversides eat copepods, mysids, shrimp, small squid, and marine worms. They are eaten by striped bass, but are protected from many predators by their shallow-water habitat.

Minor use is sometimes made of silversides as live food for trout. During World War II a few were canned for human consumption.

Suborder COTTOIDEI—Mail-cheeked fishes

The mail-cheeked fishes (also called suborder Scorpaenoidea) are differentiated from other percomorph groups by a distinctive bony modification of the cheek. The second suborbital is elongated and enlarged, extending posteriorly across the cheek to articulate with the preoperculum. Its presence is sometimes obvious but otherwise it must be revealed by dissecting away the overlying dermal tissue. Some authors confer ordinal standing on these fishes and refer to them as the Scleroparei.

This is a large group, containing about 20 families of mostly inshore fishes.

Six families and about 34 species occur in our area.

Family SCORPAENIDAE Rockfishes

The rockfishes constitute an extensive family of large fishes found along rocky shores. Many species are highly regarded as food fishes. Some are remarkable in that the fertilized eggs are retained within the body of the female and the young emerge when fully developed. Such fishes are said to be ovoviviparous.

Only two species, one common, are known to occur off our coast.

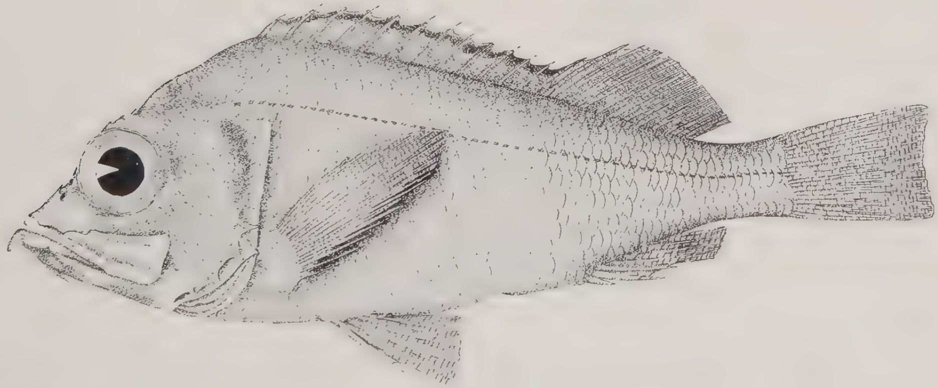
KEY to Family SCORPAENIDAE

Dorsal fin spines 12 ..... Blackbelly rosefish, *Helicolenus dactylopterus* (p. 337)
Dorsal fin spines 14 or 15 ... Redfish or ocean perch, *Sebastes marinus* (p. 338)

Blackbelly rosefish Chèvre impériale

Helicolenus dactylopterus (De la Roche) 1809

This species is included on the strength of the report by Schroeder,[414] in which were described the results of exploratory trawling along the Atlantic coast from Nova Scotia (long 63°17′W) southward to Virginia (long 74°15′W). Blackbelly rosefish were taken from the east slope of Georges Bank (long 66°00′W) southward, some 66 fish reported taken in three hauls off the Georges Bank slope. Schroeder reported that 6–8 inches was the usual size, the extreme range being 3–13 inches.



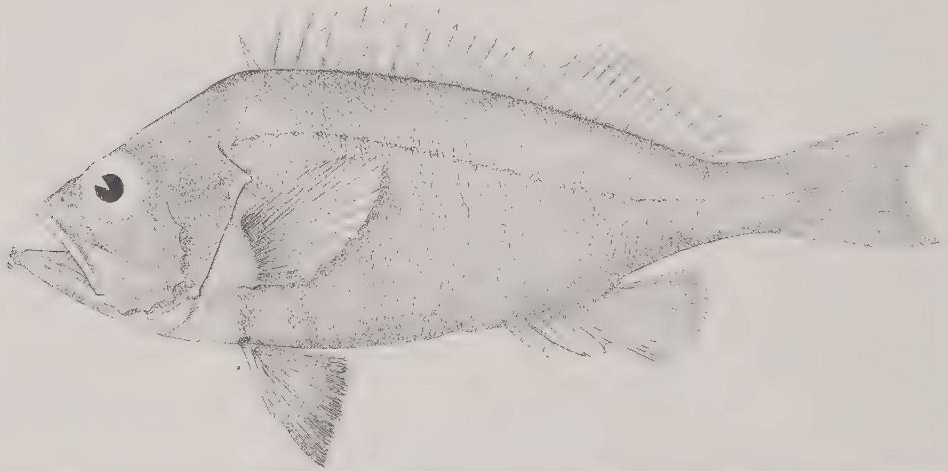
Apart from this report the species has not been recorded for the area, but the species may have gone unnoticed since it is similar in appearance to the redfish.

Redfish **Sébaste atlantique**

Sebastes marinus (Linnaeus) 1758

OTHER COMMON NAMES: ocean perch, rosefish, sebaste, poisson rouge, chèvre

DESCRIPTION: Body oblong, back elevated, greatest depth 3 in total length, just behind base of pectoral fin, thence tapering to caudal peduncle, compressed; caudal peduncle moderate. Head 3 in total length, compressed, upper profile slightly concave; mouth terminal, slightly oblique, lower jaw projecting, ending in a bony knob, angle of mouth under front of eye, slender teeth in bands in jaws and on vomer and palatines; sides of head armed with spines, 2 prominent ones at rear angle of each gill cover and series of 5 on each cheek; gill covers ending in a point above base of pectoral fins; a bony ridge above and behind each eye socket. Eye large, 4 in head, set high on head. Fins: dorsal (1) XIV–XVI, 13–16, spines strong, fifth and sixth spines are longest being almost 3 in head, spinous part of fin begins above gill opening, its base equalling length of head, soft part of fin shorter, its base about half as long as head, soft rays longer than spines immediately preceding them, the longest ones a trifle longer than longest spines, fin ends on base of caudal peduncle; caudal small, concave; anal III–IV, 7–10, located under soft dorsal, its base shorter than that of soft dorsal, spines strong, especially second, longest spine is third; pectorals large, about ⅗ length of head, base behind gill opening, rather low on sides, tip of fin rounded; pelvic fins smaller, with one strong spine, on ventral edge slightly behind base of pectorals. Lateral line pronounced. Scales present, covering body and much of head.



Colour, in general orange to flame-red, sometimes gray-red or brown-red, pale below. A dusky blotch may occur in each gill cover and several irregular dusky blotches may be present along the back and on the dorsal fin.

Two types of *S. marinus* (*mentella* and *marinus*) are recognized and these "types" or kinds are sometimes given subspecific names, although the actual status of such names is undecided. The *marinus* type is orange, or yellow-red in colour, has a relatively smaller eye, the bony protrusion on the lower jaw is usually blunt or weak. It is usually taken at depths of less than 160 fathoms. The *mentella* type is bright red in colour, has a relatively large eye, the bony protrusion on the lower jaw is long and well developed. It is most often taken at depths greater than 160 fathoms. Both forms are found in deeper waters in winter.

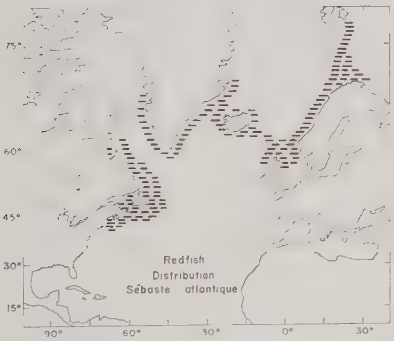
DISTINCTIONS: Only two species of scorpaenids occur in the area (see Key, p. 337), and the large eye, preopercular spines, and bright red colour set these apart from the other spiny-rayed fishes. The colour is particularly conspicuous.

SIZE: Commercial landings average from 8–16 inches. To our knowledge the largest redfish recorded from the western Atlantic was 31½ inches long and weighed 19½ pounds, but larger specimens of up to 32 inches long have been reported from Europe.[393]

RANGE: The redfish frequents the cold waters (ranging from 3 to 8 C) of gullies and deep water slopes on both sides of the North Atlantic. On the North American side large catches are taken all along the 100–200-fathom isobaths from the Nova Scotian (usually in shallower water, 50–100 fathoms) and Newfoundland banks, though the most important fishing area is the continental slope from southwestern Grand Bank to Hamilton Inlet Bank off Labrador.[282, 468] It is infrequently taken off the southern coast of Baffin Island, where the young would appear to be from West Greenland.[468, 470] It also becomes less abundant on approaching its southernmost range limit in the deep waters off New Jersey.

Large catches are taken on the edge of the shelf between Greenland and Iceland.[121] It is common in the Barents Sea to Spitzbergen, along the Norwegian coast to the Faroes, and Iceland. Individual captures are reported to the northeast off West Spitzbergen at lat 80°06′N, long 11°17′E, and off West Greenland north to Umanak Fjord (lat 71°N approximately).

Larva and young are abundant in the Norwegian Sea, west and south of Iceland (almost to Flemish Cap), in southern Greenland waters and in Newfoundland, Grand Bank, Gulf of St. Lawrence, Nova Scotia, and Gulf of Maine areas.[468]



Canadian distribution: As noted above, redfish distribution is related to temperature and depth and in general they "are not plentiful except in areas where temperatures between 3° to 8°C exist in depths of about 110 to 270 fathoms."[468] Where these conditions obtain, that is deep gullies and deep-water slopes, redfish are to be expected off the whole of the Canadian coast. Exceptions are to be found in the Bay of Fundy region where the species occurs in much shallower water than elsewhere.

BIOLOGY AND ECONOMICS: Adult redfish are typical inhabitants of deep water from 60 to 350 fathoms, which means that they are found on the edges of banks and deep channels. When on bottom during the day they are found over rocky and muddy bottom. At night they are pelagic. In the Bay of Fundy where surface waters are cool, redfish are found in as little as 5 fathoms, and even at the surface near wharves as at Eastport, Maine.[174, 495] Tagging was successful at Eastport but the recaptured fish were all from the same area. Tagging of redfish from deep water has not been successful. Redfish avoid water with a temperature of over 50 F. In the Gulf of St. Lawrence they live in areas where the temperature ranges from 39 to 42 F.

Redfish are viviparous, the eggs being retained in the ovaries of the female after they hatch until the yolk sac is absorbed; the fry are released from May to August. Females produce from 25,000 to 40,000 young per year. At birth the fry are about ¼ inch long. They remain in the surface waters until they reach a length of 1 inch after which they go to bottom. In the Scotian Shelf and Gulf of St. Lawrence areas spawning is heavy in June and July and extends through to August and September. A great deal of work has been done on the distribution of redfish fry (see Day[109] and Templeman[468] for further information).

Redfish grow very slowly and from population to population there is great variation in growth rate. The following figures must, therefore, be regarded as very general: 4-year-olds—5 inches; 8-year-olds—about 7 inches; 10-year-olds—about 9 inches; the largest fish are thought to be about 20 years old.*

In the Gulf of St. Lawrence redfish feed very largely on euphausiids with an admixture of small fishes, decapods, copepods, and amphipods. The food consists of pelagic forms.[453]

Halibut and large cod are active predators of redfish but the total effect of these predators is limited by their low numbers.

A parasitic copepod, *Sphyrion lumpi*, is found attached to, or imbedded in, redfish to some extent. Its incidence varies greatly within short geographic distances.[479]

Redfish became commercially important about 1935 when filleting of the fish was begun. Increased demand sent the catches soaring. The fishery is carried on entirely by otter trawl and is largely limited to daytime fishing, when the fish are on bottom. Most of the commercial catch is made between 100 and 300 fathoms. As the redfish grows so slowly, the history of the intensive fishery has been one of shifting to new grounds as the existing stocks are soon fished down to an unprofitable level. Landings from the western North Atlantic in 1962 are reported as 412 million pounds. This catch was shared by USSR, Iceland, Germany, United States, and Canada. The catch of redfish from the Canadian Atlantic area for 1962 was 60,079,000 pounds, with a value of $1,571,000.[70b] See Templeman[468] for a review of the fluctuations in the fishery.

Family TRIGLIDAE Searobins

The searobins, close relatives of the rockfishes and sculpins, are mainly bottom-living, shallow-water fishes, widely distributed in warm seas. Some species, however, the armoured searobins and gurnards, inhabit fairly deep water. A number of species are rather brightly coloured. The head of the searobin is encased in a bony sheath or armour, but most distinctive is the modification of the pectoral fin in which the lower or first two or three rays are free from membrane, somewhat thickened and finger-like in appearance. These specialized rays function as tentacles or feelers.

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*For detailed information see references 237, 238, 350, 394b, 453.

Two species have been caught in our area.

KEY to Family TRIGLIDAE

Pectoral fin extends back to 6th ray of 2nd dorsal fin; body and fins plain with dark mottling .... Northern searobin, *Prionotus carolinus* (p. 341)

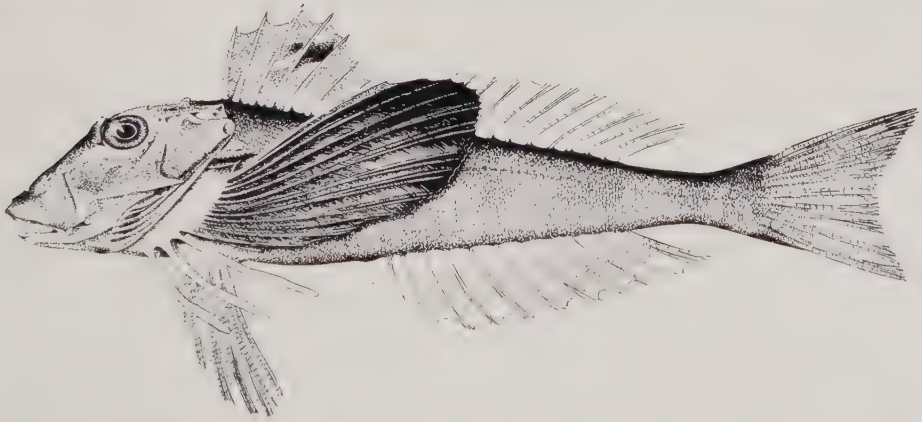
Pectoral fin extends back to 9th or 10th ray of 2nd dorsal fin; body with 2 dark, longitudinal stripes along each side .... Striped searobin, *Prionotus evolans* (p. 342)

Northern searobin **Prionote du nord**

Prionotus carolinus (Linnaeus) 1771

Other common names: common gurnard, common sea robin

Description: Body elongate, stout anteriorly, greatest depth, 5½ in total length, occurs at origin of 1st dorsal fin, body tapering thence to a moderate caudal peduncle; one sharp spine above base of pectoral fin. Head 4 in total length, entirely encased in rough bony plates, upper profile straight and steep to just above eye; mouth terminal, rather small, upper jaw projecting slightly, angle far in front of eye, bands of small teeth on jaws, vomer, and palatines, 2 short, backward-pointing spines over each eye, a rather strong spine on edge of gill cover; a conspicuous groove across top of head, behind eye. Eye about 5 in head, situated high on head. Fins: dorsals (2) 1st X, third and fourth spines longest being 2 in head, first and second spines somewhat shorter, fifth to tenth spines shortening gradually, fin originating above posterior angle of gill opening, base of fin 1¼ in head length, 2nd dorsal 13, first ray short, other uniformly about 2½ in head, fin begins immediately behind 1st dorsal and ends near caudal peduncle, its base length equal to head length; caudal large, lunate; anal I, 11, under and similar in shape to 2nd dorsal but with slightly longer rays; pectorals very large, lower 3 rays enlarged and separate from one another and from the remainder of the fin, the lowermost ½ head



length, the uppermost ⅔ of head length, base of fin immediately behind gill opening, end of fin rounded, longest rays reaching 6th ray of anal; pelvics smaller, longest rays ⅘ of head length, located ventrally under bases of pectorals. Lateral line indistinct. Body covered with small, rough scales.

Colour, grayish or reddish-brown above, whitish or pale yellow below; about five dark, saddle-like blotches along the back; a black spot between 4th and 5th spines of first dorsal, unpaired fins otherwise grayish to brownish; pectorals yellowish to orange with two broad, dusky cross-bars; pelvic fins yellowish-brown.

DISTINCTIONS: The general appearance of the northern searobin suggests the sculpin family but the fish is readily distinguished by the three free rays of the pectoral fins; it also differs from the sculpins in having the head encased in bony plates. The striped searobin has a prominent longitudinal, dark-brown stripe on each side of the body, which the northern searobin lacks. The free pectoral rays are stouter in the northern than in the striped species; the caudal fin is lunate in the northern searobin and truncate in the striped searobin.

SIZE: Up to a length of 14½ inches and a weight of approximately 1¾ pounds.[278]

RANGE: Inshore waters along the eastern coast of the United States, south to South Carolina; straying into the Bay of Fundy, but uncommon north of Cape Cod; also reported on Georges Bank.

Canadian distribution: The only known Canadian records are confined to the Bay of Fundy, where it has been caught about eight times. Apart from one in Minas Channel[49] the places of capture are at the lower end of the Bay from Passamaquoddy Bay: Deer Island, Campobello, Grand Manan, off Digby Gut, and in St. Mary Bay.[205, 324, 395, 396]

BIOLOGY AND ECONOMICS: Off New England searobins are found close to shore and also in depths up to 90 fathoms, especially in winter when they move offshore. Sometimes they are pelagic and have been hooked near the surface by anglers.

Spawning occurs from June to August; the eggs are spherical, about .04 inch in diameter, yellowish, containing many, very small oil globules, and are buoyant. They hatch in about 2½ days at a water temperature of 72 F,[252] and the species reaches a length of 9 inches in 2 years.

The food of the northern searobin consists chiefly of small shrimp and amphipods; they also take annelids, copepods, and a few fishes.

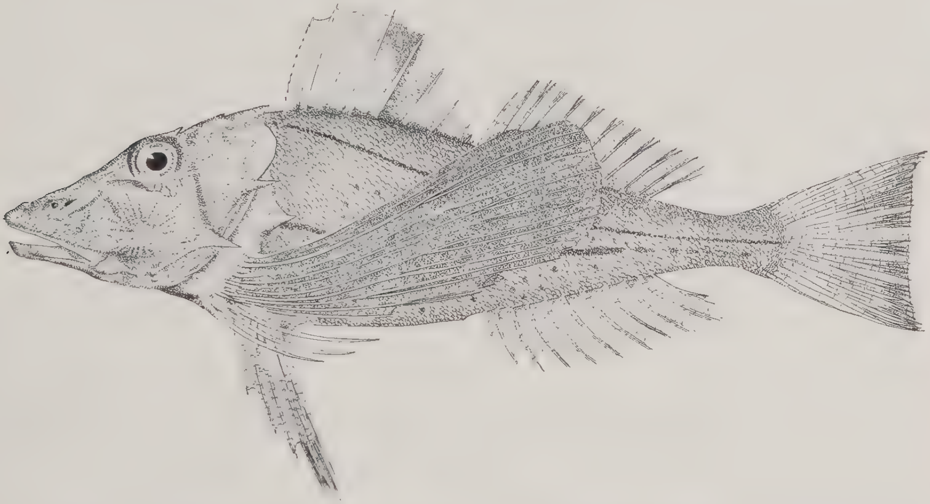
While the searobin is of no importance in Canada, it is abundant enough farther south to permit nearly half a million pounds being marketed in some years. While reputed to be a satisfactory table fish, most are used as bait.[278]

Striped searobin Prionote strié

Prionotus evolans (Linnaeus) 1766

OTHER COMMON NAMES: northern striped gurnard, brown-winged sea robin

DESCRIPTION: Body robust, moderately elongate, greatest depth 5½ in total length, occurring at middle of first dorsal, body then tapering gradually to a moderate caudal peduncle; a sharp, backward-directed spine above base of pectoral. Head 3⅓ in total length, completely covered by bony plates; 2 backward-pointing spines near edge of gill cover; 3 pairs of inconspicuous spines on top of head, near eyes and a larger pair at back of head, just before first dorsal; mouth terminal, moderate, angle in front of eye, bands of small, almost granular teeth on jaws, vomer and palatines. Eye moderate, almost 5 in head, high on side of head. Fins: dorsals (2), 1st X, third spine longest being 2½ in head, first and second spines a little shorter, last 5 spines quite short, base $1^7/_{10}$ in head, fin commencing above posterior edge of gill cover, 2nd dorsal 12, second and third rays longest, equalling longest spiny rays, base 1⅓ in head length, fin originates immediately behind 1st dorsal and ends just before caudal peduncle; caudal large, square; anal 11, under 2nd dorsal, rays a little shorter; pectorals very long, reaching ninth ray of 2nd dorsal, end rounded, lower 3 rays separate from one another and feeler-like, rather slender, upper longest, about 1½ in head, lower shortest, about 2 in head, base of fin along gill opening; pelvics situated ventrally, between bases of pectorals, longest rays 1½ in head. Lateral line well marked. Body covered with small, rough scales.



Colour, of sides reddish to olive-brown, a marked dark-brown stripe below the lateral line; there is a dark blotch between the fourth and fifth spines of the first dorsal; the large pectoral fins are orange to brown with pale edges and without cross-bars; the pectoral feelers have narrow brown bars on an orange background.

Distinctions: The striped searobin closely resembles the northern searobin but its square-ended tail, longer pectoral fins, more slender pectoral feelers, larger mouth, and the dusky stripe on the sides readily separate it from the northern species with its lunate tail and uniformly coloured sides. The free pectoral fin rays and bony plates on the head differentiate it from the sculpins and from the flying gurnard.

Size: Up to a length of about 18 inches.[49]

Range: Shallow water on the eastern coast of North America from Cape Cod to South Carolina; rarely straying north to the Bay of Fundy.

Canadian distribution: Only reported in 1957, when 3 specimens, from 10¼ to 12½ inches long, were found at Deer Island, Campobello, and off Grand Manan, N.B., between mid-September and the end of November. These specimens are preserved at the Biological Station, St. Andrews, N.B.

Family COTTIDAE Sculpins

The sculpins are northern fishes living on the bottom in both marine and fresh waters. While the majority are marine species, a large number also occur in the fresh waters of northern North America, Europe, and Asia and although most species are confined to shallow waters, some species occur in depths to 700 fathoms. Sculpins are stout-bodied fishes with large heads and prominent eyes, and the preopercular bone is often armed with spines. There are two dorsal fins, one spiny and one soft-rayed, the pectoral fins are usually well developed and fan-like and the pelvics, typically of one spine and five soft rays, are often reduced to one spine and four, three, or two soft rays. The body may be almost completely smooth with scattered tuberculate scales, or completely covered with plate-like scales.

About 300 or more species are known, 14 of which occur off our coasts.

KEY to Family COTTIDAE

1 Dorsal fins obvious and separated into 2 more or less distinct parts, but not a continuous fin 2

Dorsal fins not separated but forming a single fin, this fin low and skin-covered, not conspicuous 14

2 Head and chin with fleshy tabs; skin on body and head rugose or pebbly .... Atlantic sea raven, *Hemitripterus americanus* (p. 350)

Head and chin without fleshy tabs; skin mainly smooth or spiny 3

3 Palatine teeth present; upper preopercular spine either curved upward and simple, or deeply bifurcated 4

Palatine teeth absent, upper preopercular spine straight and simple (sometimes inconspicuous), if curved upward then broad toward tip (*Gymnocanthus*) and not deeply bifurcated 6

4 Upper preopercular spine pointed, not bifurcate, but strongly hooked upward; outer margin of dorsal fin often with dark pigment and both dorsal fins on males with distinct round or oblong spots .... Arctic hookear sculpin, *Artediellus uncinatus** (p. 346)

Upper preopercular spine obviously forked or bifurcate (sometimes 3-pronged); a row of spiny plates above lateral line 5

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*Some authors[291b] distinguish two species as follows: *A. uncinatus*—dorsal rays 12 or 13; anal rays 10–12; lateral line pores 24–28; dorsal fins of mature males with round, light spots. *A. atlanticus*—dorsal rays 13–15; anal rays 11–13; lateral line pores 18–25; dorsal fins of mature males with light bars or bands.

5 Lateral line plates with small spines below pores as well as above; lateral line often incomplete, terminating on the caudal peduncle .... Twohorn sculpin, *Icelus bicornis* (p. 351)

Lateral line plates without small spines below pores; lateral line usually complete .... Spatulate sculpin, *Icelus spatula* (p. 352)

6 Upper opercular spine broad or with 2 or 3 spinules or cusps toward tip; vomer without teeth .... Arctic staghorn sculpin, *Gymnocanthus tricuspis* (p. 348)

Upper opercular spine simple; vomer toothed 7

7 Lateral line armed with rows of plates, each with backwardly directed spines; area below lateral line with folds arranged in oblique rows (*Triglops*) 8

Lateral line not armed with rows of plates; area below lateral line not in folds; opercular and head spines usually well developed (*Myoxocephalus*) 10

8 Pectoral fin rays 20–22; eye large, diameter of bony orbit greater than, or equal to, postorbital head length; body pigmentation restricted to 4 or 5 thin, oblique lines which in males tend to run together to form 2 lateral stripes; head usually dusky .... Nybelin's sculpin, *Triglops nybelini* (p. 361)

Pectoral fin rays 17–19; eye moderate, diameter of bony orbit not exceeding postorbital head length; pigment variable, usually 3 or 4 large dorsal blotches or a series of small irregular spots, or blotches, along sides, or both; head often spotted 9

9 Caudal fin with 2 or 3 cross bars; a small black spot at the outer edge of membrane between first and 2nd spines of first dorsal fin, spot most prominent in males; snout rounded .... Mailed sculpin, *Triglops murrayi* (p. 362)

Caudal fin without cross bars; no black spot at anterior tip of first dorsal fin; snout straight, somewhat like a duck's bill .... Ribbed sculpin, *Triglops pingeli* (p. 362)

10 Preopercular spines 4, 2 directed forward, the first concealed in skin, 2 directed rearward; at least 4 rough-topped spines atop head .... Fourhorn sculpin, *Myoxocephalus quadricornis* (p. 357)

Preopercular spines 3, one directed downward or forward, 2 directed rearward; top of head without rough-topped spines 11

11 Upper preopercular spine long, about 4 times as long as spine below it; all head spines sharp .... Longhorn sculpin, *Myoxocephalus octodecemspinosus* (p. 355)

Upper preopercular spine not conspicuously long, at most twice as long as spine below it 12

12 Origin of spinous dorsal fin in advance of posterior tip of operculum, tip usually under 3rd or 4th spine .... Grubby, *Myoxocephalus aenus* (p. 354)

Origin of spinous dorsal fin not distinctly in advance of posterior tip of operculum 13

13 Pectoral fin rays 14–16; well-developed fleshy tabs or cirri present over eyes . .. . Arctic sculpin, *Myoxocephalus scorpioides* (p. 360)

Pectoral fin rays 17 or 18; well-developed spines over eyes, not cirri .... Shorthorn sculpin, *Myoxocephalus scorpius* (p. 358)

14 Skin almost naked and smooth except for a few fine spines; eyes large, diameter greater than interorbital width; body colour grey-brown, without blotches . ... Pallid sculpin, *Cottunculus thompsoni* (p. 348)

Skin rough; eyes small, the diameter less than interorbital width; head spotted; body usually with at least 3 broad bands of blotching .... Polar sculpin, *Cottunculus microps* (p. 347)

Arctic hookear sculpin

Crochet arctique

Artediellus uncinatus (Reinhardt) 1833

Other common names: arctic sculpin, hookear sculpin, crapaud de mer

Description: Body elongate, greatest depth 5 in total length, a little before origin of first dorsal, body tapering from there to a long, slender caudal peduncle; rounded in cross-section. Head large, broad, 3⅓ in total length; gill cover ending in a covered spine high on side; a long hook-like spine on each cheek, pointing backward and then upward; below and in front of this is a smaller curved spine pointing forward; on top of head 2 small spines between eyes and 2 slightly larger ones well behind eyes; mouth terminal, angle under middle of eye, narrow bands of small teeth on jaws, vomer, and palatines; a minute thread-like tentacle near angle of mouth. Eye large, 3½ in head, placed high on head. Fins: dorsals (2) 1st VII–IX, rounded, beginning over gill opening, base 2 in head, longest spines 4 in head, 2nd dorsal 12–14, first ray short, next 4 or 5 equal longest spines of 1st dorsal, base twice length of 1st dorsal, beginning immediately behind 1st dorsal and ending on caudal peduncle; caudal small, spade-shaped; anal (1) 10–12^{25} a little shorter than 2nd dorsal and almost as high, situated under 2nd dorsal; pectorals, 20–22, large, longest rays ¾ length of head and reaching beginning of anal, base extends along edge of gill opening from near ventral edge to above middle of side, end of fin rounded; pelvics, 3, long and slender, length 2 in head, located on ventral edge under beginning of pectorals. Skin smooth, naked. Lateral line straight.

Colour, light mottled with dark- and pale-brown or reddish; a blotch at base of caudal fin; head somewhat mottled with brown; spinous dorsal blackish with two white streaks and a series of spots running across the spines; second dorsal, anal, and pectoral fins with dark cross-bars.

Distinctions: This fish may be recognized as a sculpin by its large, spiny head, very wide gill openings, broad mouth, slender body, and separate spinous and soft dorsal fins. The pectorals are large and the pelvic fins are reduced to three rays. The arctic hookear sculpin is distinguished from the others by the long hook-like spine with its tip directed upward, on each cheek.

Size: One of the smallest sculpins; not exceeding 4 inches in length.

Range: Coastal regions of northern North America and northern Europe. From Nain, Labrador, south to Cape Cod. Around Greenland; at Bear Island in 223 fathoms; Nova Zembla; northern Norway and Siberia.

Canadian distribution: Reported from Collingham's Cove, Hamilton Inlet, in 1891,[240] its Labrador distribution has since been extended to Nain Bay where it was found in 1951.[25] The latter author reported it from 7 to 45 fathoms from various localities in Hamilton Inlet. Near Raleigh, Newfoundland.[17] In the Gulf of St. Lawrence it was caught off Trois Pistoles, Que.;[357, 514] a small specimen was caught in 50 fathoms between Cape Breton and the Magdalen Islands.[95] At various points on Grand Bank between lat 43°00′N, long 50°47′W, and lat 45°44′N, long 54°27′W;[170] on northeastern part of Grand Bank and near St. Pierre.[17] Off Sydney, Nova Scotia;[18] near Misaine Bank, east of Banquereau at lat 44°26′N, long 57°11′W, in 190 fathoms, and off Halifax at lat 44°29′N, long 62°10′W.[170] Off Cape Sable, Nova Scotia.[210] One specimen 2¾ inches long was caught in Passamaquoddy Bay, August 26, 1952.

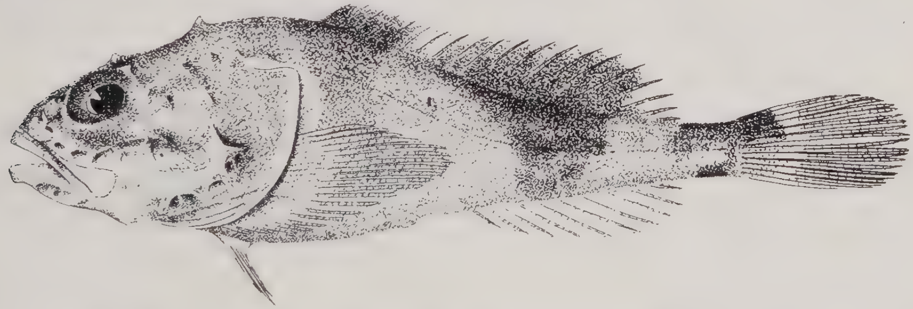
Polar sculpin

Cotte polaire

Cottunculus microps Collett 1875

OTHER COMMON NAMES: cotte arctique, crapaud de mer

DESCRIPTION: Body elongate, tadpole-shaped, greatest depth 4 in total length, occurring at gill opening, tapering quickly to a slender caudal peduncle. Head very large, 3⅕ in total length; 4 bony knobs on top of head and several on sides; mouth large, terminal, oblique, angle under middle of eye, small conical teeth in jaws and on vomer. Eye large, 3½ in head, located high on head. Fins: dorsal (1), VI–VIII, 13–15, spines feeble, spinous portion lower than soft portion, not divided, longest rays 3 in head, base 1⅓ times head length, beginning just behind gill opening; caudal moderately large, rounded: anal 10, under and similar in size to soft portion of dorsal fin; pectorals large, base along lower ⅔ of gill opening, length of fin ⅔ that of head; pelvics small, located under lowest and most anterior part of pectorals, longest rays 3 in head. Lateral line high on body. Skin roughened by small warts.



Colour, pale, with three broad dusky bands on body and fins, one on head, one through spinous dorsal and pectoral and one through soft dorsal and anal; a small band on base of caudal.

DISTINCTIONS: The polar sculpin resembles the other sculpins with its large bony head, large mouth, tapering body, and large pectoral fins. It is readily distinguished by its spinous and soft dorsals being united in one fin and by the reduction of the head spines to bony knobs; all other sculpins from this area have separate spinous and soft dorsal fins and definite spines on the head.

SIZE: Up to 8 inches in length.

RANGE: An arctic deep-water species, known on both sides of the North

Atlantic Ocean in depths of 110–490 fathoms. From the Gulf of St. Lawrence to off New Jersey; from off east Greenland, northern Iceland, and Spitzbergen; from Norway to the English Channel.[49]

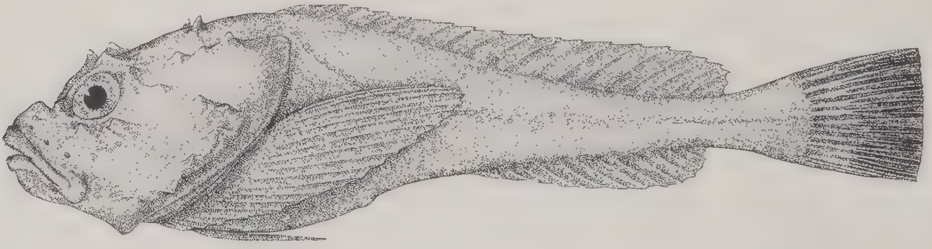
Canadian distribution: The polar sculpin is reported from the Gulf of St. Lawrence off Trois Pistoles, P.Q.,[494] and from 3 miles east of Fox River, P.Q. where three specimens were caught in 112–130 fathoms in 1954.[458] Off Nova Scotia two specimens were caught by the *Albatross* in 122 and 141 fathoms many years ago. They were taken at lat 42°23′N, long 66°23′W, and at lat 42°15′N, long 65°48′W, southwest of Browns Bank.[49]

BIOLOGY AND ECONOMICS: One of the Gulf of St. Lawrence specimens had eaten mysid shrimp and marine worms.[458]

Pallid sculpin **Cotte blême**

Cottunculus thompsoni (Günther) 1882

This cottid has been taken off the North American Atlantic coast in depths ranging from 100 to over 800 fathoms. Schroeder[414] has noted that the species was rather generally distributed off Nova Scotia, Georges Bank, and southward in depths ranging from 250 to 700 fathoms. There are specimens from off Nova Scotia (lat 42°44′N, 63°17′W) taken at depths of 400–500 fathoms in the collections of the Museum of Comparative Zoology, Harvard University. The distribution pattern suggests that it prefers warmer temperatures than the polar sculpin, *C. microps.*

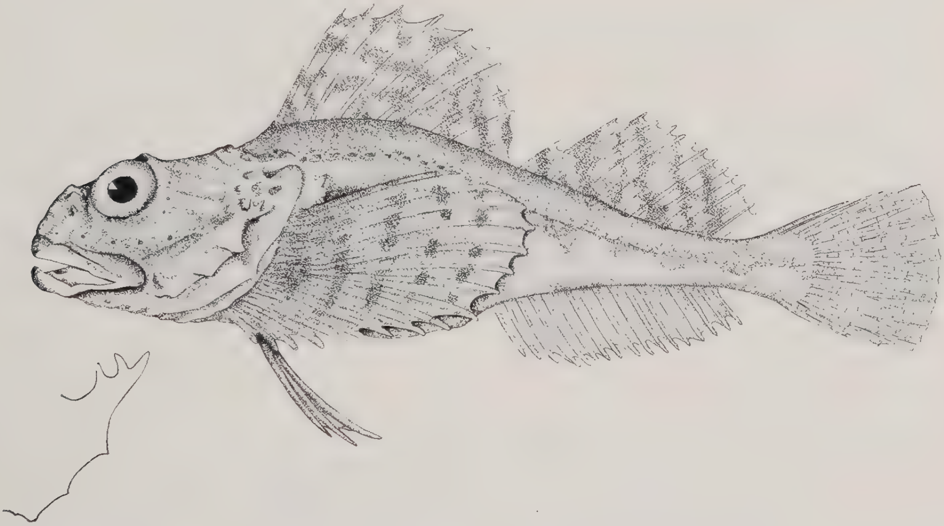


Arctic staghorn sculpin **Tricorne arctique**

Gymnocanthus tricuspis (Reinhardt) 1832

OTHER COMMON NAMES: crapaud de mer

DESCRIPTION: Body elongate, greatest depth about 5½ in total length, at middle of 1st dorsal fin, body tapering regularly from there to a slender caudal peduncle. Head 4 in total length, upper surface prickly, broad, spines on ridges on top of head very small or lacking, 3 very blunt spines on preopercle, the upper one broad and flat with 3 short, sharp branches at tip, total spine length less than diameter of eye; upper corner of gill cover rounded; mouth terminal, lower jaw projecting slightly, angle of mouth under middle of pupil of eye, small teeth on jaws only. Eye large, 4 in head, located high on head. Fins: dorsals (2) 1st X–XII, moderately high, 3rd and 4th spines longest being 2¼ in head, gradually decreasing to the last spine which is very short, length of base 1⅓ in head, beginning just behind gill opening, 2nd dorsal 14–17,[25] first 3 rays graduated, 3rd and 4th rays equalling height of longest spines in first dorsal, base length just slightly less than head length, a slight gap between 1st and 2nd dorsals; caudal moderately large, rounded; anal 15–19, slightly lower than dorsal fins, under but slightly longer than 2nd dorsal and originating before it; pectorals 17–21,[25] large, fan-like, base extending along entire edge of gill opening, tip of fin under gap between dorsals but lower rays much shorter; pelvics 3, located ventrally under base of pectorals, short in young specimens, reaching beyond origin of anal in adults, especially in males at breeding season. Lateral line high on body. Skin smooth.



Colour, dark-brownish or gray above, the sides marked with dark cross-bands; belly pale or yellowish, a sharp irregular line of demarkation between light and dark colour. Dorsal and pectoral fins with brown or black cross-bands; anal and pelvic fins with yellow rays.[49]

Distinctions: The arctic staghorn sculpin is readily distinguished by the flat, branched, upper spine on the preopercle. Its anal fin originates in front of the second dorsal, instead of behind it as in the other sculpins. The rounded upper corner of the gill cover is also distinctive when compared with the sharp corner of the grubby, the shorthorn, and longhorn sculpins.

Size: Up to a length of 10 inches.

Range: Arctic and North Atlantic oceans south to the Gulf of St. Lawrence and to northern Norway. Collected once at Eastport, Maine.

Canadian distribution: Reported from Bernard Harbour, Northwest Territories;[518] from Hudson Bay at Cape Merry Peninsula and Nottingham Island, common in Ungava Bay;[124, 496] at Lake Harbour, Baffin Island;[122] very common along entire Labrador coast;[25, 122, 240, 523] from the Strait of Belle Isle at Raleigh, Nfld.;[209] north shore of the Gulf of St. Lawrence;[49] Trois Pistoles, Que.[357, 514] While there is no strictly Canadian record south of this, one was caught in 1872 at Eastport, Maine, just over the Canadian border.[240] It is preserved in the United States National Museum.

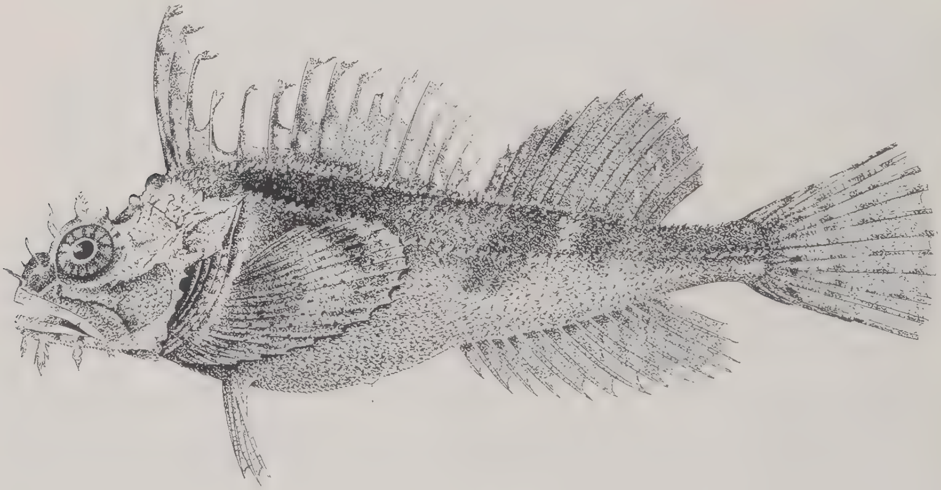
BIOLOGY AND ECONOMICS: The arctic staghorn sculpin is confined to cold water and has only been taken where the temperature was between 29 and 41F. A few have been caught in 1–2 fathoms of water but it is most abundant below 10 fathoms. The greatest depth of capture was 95 fathoms.[25]

Atlantic sea raven Hémitriptère atlantique

Hemitripterus americanus (Gmelin) 1789

OTHER COMMON NAMES: whip sculpin, gurnet, puff-belly, scratch-belly, crapaud de mer

DESCRIPTION: Body elongate, heavy forward, greatest depth $3\frac{4}{5}$ in total length occurring at 6th ray of 1st dorsal, tapering thence to a moderate caudal peduncle. Head large, $3\frac{3}{4}$ in total length, with numerous bony humps and ridges on upper surface and with 7–11 pairs of short, simple or branched fleshy tabs on head, including several on lower jaw; 2 short spines on gill cover; mouth terminal, oblique, angle extending slightly beyond eye, jaws with several rows of stout sharp teeth. Eye large, 5 in head, placed high on head. Fins: dorsals (2), 1st XVI, first spine highest, about $1\frac{1}{2}$ in head, then rapidly decreasing until fourth and fifth spines are $3\frac{1}{2}$ in head, subsequent spines except last 2 irregularly longer, fin membrane irregularly emarginate, but expanded at tip of each spine as an irregular flap of skin, fin begins above opercle, base of fin $1\frac{1}{3}$ times head length, 2nd dorsal I, 12, rounded, middle rays longest $1\frac{3}{5}$ in head, length base $1\frac{2}{3}$ in head length, distinctly separated from 1st dorsal by a very short space; caudal rather large, regularly rounded; anal 13, regular, under but longer than 2nd dorsal, base being only slightly less than head length, 10th and 11th rays longest being $1\frac{4}{5}$ in head length; pectorals large, rounded, base extending along lower $\frac{2}{3}$ of gill opening, tip of fin under 12th ray of 1st dorsal; pelvics I, 3, situated ventrally under middle of base of pectorals, ray length 2 in head. Lateral line moderately high on body. Scaleless, skin with prickles everywhere, but enlarged near back and lateral line.



Colour, reddish-brown, marbled with darker brown and much variegated; yellowish on belly; fins variegated with light and dark.

DISTINCTIONS: The sea raven can be readily identified by its sculpin-like appearance. It differs from other sculpins in having fleshy tabs on the head, in the ragged appearance of the first dorsal fin, and in the larger teeth in the jaws.

SIZE: Up to 25 inches in length and a weight of 7 pounds;[49] weights of 3 and 4 pounds are not unusual.

RANGE: Atlantic coast of North America to a depth of 100 fathoms; occurring regularly from the Strait of Belle Isle and Grand Bank to Chesapeake Bay; rare on the Labrador coast.

Canadian distribution: There is a single Labrador record from Hamilton Inlet, where in July 1952 a 12½-inch specimen was caught;[25] also reported once from Raleigh, Nfld., on the Strait of Belle Isle, a 19¼-inch one in July 1929;[209] from Trinity Bay, Nfld.[17] In the Gulf of St. Lawrence from the Trois Pistoles region, Que.;[494] from Gaspé;[450] rare at Anticosti;[405] Magdalen Islands; common in Miramichi estuary;[93, 312] scarce at Tignish, P.E.I.;[92] sparingly distributed on Cape Breton coast of Gulf of St. Lawrence.[95] Very common off Canso, N.S., in 1–60 fathoms;[91] common along outer coast of Nova Scotia in 15–50 fathoms.[513] Moderately common in the Bay of Fundy including Minas Basin, Passamaquoddy Bay, Annapolis Basin, and St. Mary Bay;[205] Saint John harbour, N.B.[93] Offshore it is reported from Grand Bank,[35] Banquereau, and Sable Island Bank.[17, 19]

BIOLOGY AND ECONOMICS: The sea raven lives on rocky or hard bottom, is voracious and eats any bottom invertebrates that are available, including crustaceans, molluscs, and sea urchins; it also takes such fishes as herring, sand lance, and silver hake.

The eggs are large, about ⅙ inch in diameter, almost spherical, pale yellow to brilliant orange in colour. Females produce up to 40,000 eggs but average about 15,000. The eggs are adhesive when extruded and adhere in small clusters of 140–500. They have been found attached to the finger sponge and very occasionally to the bread sponge. In southern New England they spawn from November to January.[521]

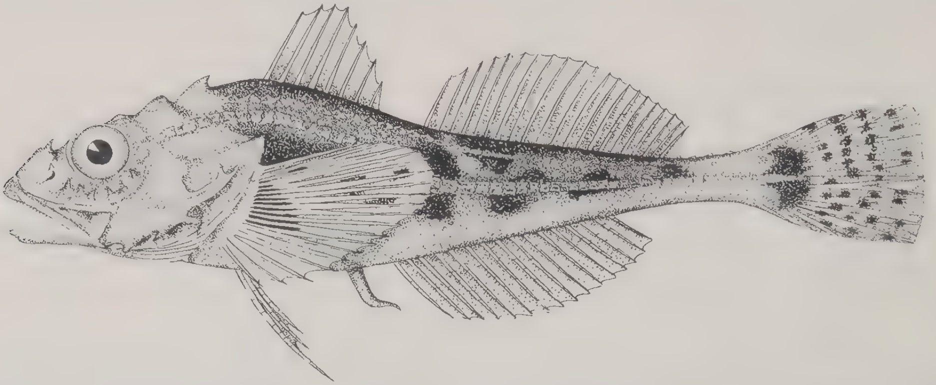
When taken from the water the belly usually becomes inflated, so that specimens that are returned to the water are unable to submerge. The same enlargement also occurs when they swallow large volumes of sea water.[521]

Sea ravens are of minor importance as bait in lobster fishing.

Twohorn sculpin — Icèle à deux cornes

Icelus bicornis (Reinhardt) 1841

DESCRIPTION: Body elongate, greatest depth 5½ in total length, occurring at origin of first dorsal fin, body tapering from there to a rather slender caudal peduncle. Head 3⅔ in total length, massive, profile rather steep, 2 blunt spines on top of head behind eye, 1 spine in front of eye, 4 spines on preopercle, the first divided and directed upward; mouth terminal, low on head, angle under posterior edge of pupil of eye, bands of villiform teeth in both jaws. Eye large, 3⅓ in head, located high on head. Fins: dorsals (2) 1st VIII–IX, rounded, middle rays longest being 3 in head, base 2 in head, origin over gill opening, 2nd dorsal 18–21, rounded, middle rays longest being 2 in head, base about equal to length of head, a short space between the 2 dorsal fins; caudal large, slightly rounded; anal 14–16, middle rays longest, about 3 in head, base about ⅘ length of head, fin originates under beginning of 2nd dorsal; pectorals large, longest rays ⅘ length of head, base low on sides, a short distance behind gill opening; pelvics narrow, 3-rayed, middle ray longest, ⅔ length of head, located ventrally slightly before pectorals. Lateral line marked, not always reaching base of caudal. Scales present, a specialized row just below the dorsal fins and another along the lateral line, both rows with posterior spines on each scale, those on the lateral line with spines both above and below the lateral line pore. Anal papilla in the males pronounced, with a slender prolongation, entire structure ⅗ of head length.



Colour, yellowish, with many brown spots.

DISTINCTIONS: Sculpins of the genus *Icelus* are characterized by the two rows of scales bearing spines on the posterior edges. In *Icelus bicornis* the scales of lateral line have spines both above and below the pores, while in *I. spatula* the spines occur above the pores only.

SIZE: Up to a length of 4¾ inches.[496]

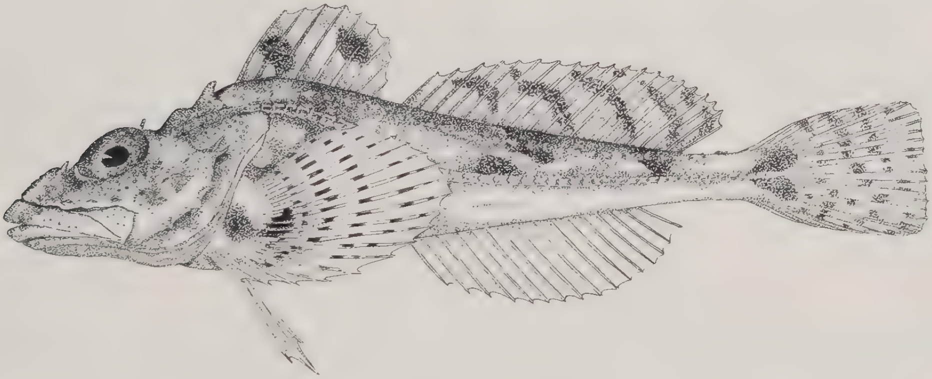
RANGE: Northwestern Canadian arctic,[517] Hudson and Ungava bays; West and East Greenland, Iceland, Jan Mayen, Spitzbergen, Barents, and Kara seas, Bohuslän (Norway).[222]

Canadian distribution: Mould Bay, Prince Patrick Is.; Bernard Harbour, N.W.T.; Union and Dolphin Strait; Alert, Ellesmere Is.[517, 518] Jones Sound (lat 76°08′N, long 80°53′W) and east of Coburg Is., Baffin Bay (lat 76°40′N, long 76°20′W).[222] Hudson Bay at two widely separated stations.[496] Ungava Bay between Payne Bay and Akpatok Is. in 40 fathoms.[124] Specimens under 1 inch in length taken in the Gulf of St. Lawrence near Orphan Bank and the Magdalen Is. were referred to this species,[102] but it seems probable that they were the young of *I. spatula.*

Spatulate sculpin — Icèle spatulée

Icelus spatula Gilbert and Burke 1912

DESCRIPTION: Body elongate, greatest depth 5 in total length, occurring at beginning of 1st dorsal fin, body tapering from there to a slender caudal peduncle. Head 3½ in total length, bluntly pointed, upper preopercular spine small, directed towards 1st dorsal fin, usually bifurcate, simple in some Labrador specimens, 3 smaller slender spines below this on edge of preopercle; 2 blunt occipital spines on top of head; mouth terminal, angle under posterior part of pupil of eye, broad bands of villiform teeth on both jaws, with narrow bands on vomer and palatines. No slit behind last gill arch. Eye large, nearly 4 in head in males, smaller in females. Fins: dorsals (2), 1st VIII–X, first rays 3½ in head, remainder shorter, base about 2 in head, fin originates over posterior part of gill cover, 2nd dorsal (17) 19–21, middle rays 2 in head, separated from 1st dorsal by a short space, base a little longer than head, fin ending on caudal peduncle; caudal moderate, truncate; anal 14–17, middle rays longest 2½ in head, located under 2nd dorsal but base slightly shorter than that of 2nd dorsal; pectorals large, rounded, longest rays ⅘ length of head, base just behind gill opening and extending along lower ⅔ of it; pelvics small, rays about 2 in head, located ventrally under forward part of pectorals. A series of bony plates under bases of dorsal fins, beginning about middle of spinous dorsal and extending to middle of caudal peduncle, a band of prickles along these plates; a complete series of bony plates along the lateral line; a few large spiny plates behind pectoral fins; top and sides of head covered with minute prickles. Lateral line well marked. Males with a long papilla at the vent.



Colour, background brownish to olive, mottled with darker; usually two narrow dark blotches on spinous dorsal; soft dorsal and caudal irregularly barred; pectoral with a small dark blotch at base, its posterior and upper parts faintly barred; anal and pelvic fins plain; head mottled like the back; belly white.[158]

DISTINCTIONS: The absence of a slit behind the last gill arch separates the spatulate sculpin and other members of the genus *Icelus* from all sculpins except the hookear species. Its divided upper preopercular spine readily separates it from the latter; when this character fails its larger number of second dorsal fin rays may be used (19–21 rays in the spatulate and 12–13 rays in the hookear). The bony plates on the sides of the spatulate sculpin also distinguish it from the hookear species which has the skin naked.

It closely resembles *Icelus bicornis*. Males may be distinguished by the shape of the urogenital papilla; it is long and expanded in *I. spatula*, and short with a narrow prolongation in *I. bicornis*. Females can be distinguished by the form of the lateral line scales; these have well-formed spines, both dorsal and ventral to the lateral line pore in *I. bicornis* but only dorsal to the pore in *I. spatula.*[124]

SIZE: Up to a length of 4¼ inches.[25]

RANGE: An arctic species known from the Bering Sea, the Kamchatka coast, west to the Kara Sea; from Ungava Bay and Labrador; eastern Baffin Island; and West Greenland.[124]

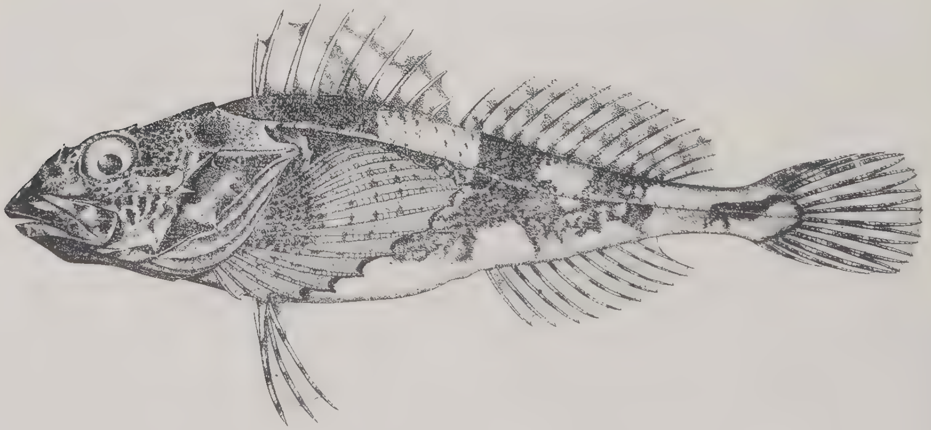
Canadian distribution: Reported from Bernard Harbour, N.W.T., as *I. bicornis* but now believed to be *I spatula;*[517, 518] Ungava Bay between Pape Bay and Akpatok Island and from Exeter Sound, eastern Baffin Island.[124] It is found along much of the Labrador coast. *Icelus bicornis* was reported from Komaktorvik Bay (59°20′N) by Kendall[211] but Backus[25] considers it probable that he had *I. spatula.* More recently it has been found repeatedly on the Labrador coast from St. Lewis Sound (52°21′N), through Hamilton Inlet, Hebron Fjord and north to Kangalaksiorvik Fjord (59°23′N) in depths of 9–125 fathoms.[25, 172]

Grubby **Chaboisseau bronzé**

Myoxocephalus aeneus (Mitchill) 1815

OTHER COMMON NAMES: little sculpin, crapaud de mer nain

DESCRIPTION: Body moderately elongate; greatest depth 4½ in total length, at middle of 1st dorsal; caudal peduncle rather slender. Head broad, 3⅕ in total length, covered with smooth skin; a ridge on top of head over each eye with 2 short spines; a pair of short spines between nostrils; 3 short spines on preopercle, the lower one directed downward, and 3 on opercle (gill cover); mouth terminal, upper jaw longer, angle of mouth under middle of pupil of eye, small teeth on jaws and vomer. Eye 5¼ in head, near top of head. Fins: dorsals (2) 1st IX, originates over posterior part of gill cover, longest rays 3 in head, base ⅔ length of head, 2nd dorsal 13–14, almost as high as 1st dorsal, originating immediately behind 1st dorsal and extending out on caudal peduncle, its base 6/7 of head length; caudal moderate, rounded; anal 10-11, located under 2nd dorsal, its base ⅗ length of head, rays a little shorter than those of 2nd dorsal; pectorals large, fan-like, with a long base extending along much of edge of gill opening, reaching



to end of 1st dorsal; pelvics I, 3, rays almost ½ length of head, located on ventral edge under middle of base of pectorals. Lateral line prominent, high on anterior part of body. Skin smooth, without scales; small warts between eyes.

Colour, variable depending on bottom, light to dark gray or greenish-gray, with darker shadings on the sides and broken bars on fins; belly pale gray to white.

DISTINCTIONS: This little fish is recognized as a sculpin by its broad spinous head, its two separate dorsal fins, its fan-like pectorals, included lower jaw, and small teeth in the jaws. It is readily distinguished from the short and long-spined sculpins by its very short head spines and fewer rays in the second dorsal and anal fins; from the sea raven by its regular spinous dorsal fin, from the polar sculpin by its separate dorsal fins.

SIZE: The grubby rarely exceeds 6 inches in length.

RANGE: Coastal waters of North America from the Strait of Belle Isle to New Jersey.

Canadian distribution: The most northerly record appears to be for Raleigh, Newfoundland, where two specimens, 3¾ inches long, were caught in 1929;[209] the only other Newfoundland report is for Port au Port Bay.[228] Reported from various points in the Gulf of St. Lawrence, viz. Trois Pistoles, Quebec; [514] Port Daniel in Chaleur Bay;[229] tidal parts of the Miramichi estuary;[312] common in Malpeque Bay, Prince Edward Island;[331] abundant at the Magdalen Islands and from cod stomachs in 60–70 fathoms off Cheticamp, Nova Scotia; at Souris, P.E.I.[49] Reported for shallow inlets along the whole coast of Nova Scotia.[513] Common in shallow water in the Bay of Fundy, including the Annapolis Basin and St. Mary Bay; rare in Minas Basin.[205]

BIOLOGY AND ECONOMICS: In the Gulf of St. Lawrence the grubby is found in estuaries, as it is on the Nova Scotia coast and in the southern part of its general range. In the Bay of Fundy and Gulf of Maine it is more common on the open coast than in the estuaries. It is tolerant of temperatures between 32 and 70 F.

In New England it spawns in the winter but a ripe female was found in late June at the Magdalen Islands.[95] The eggs are spherical, $\frac{1}{25}$ inch in diameter, green, and they adhere to seaweed or other objects on bottom.

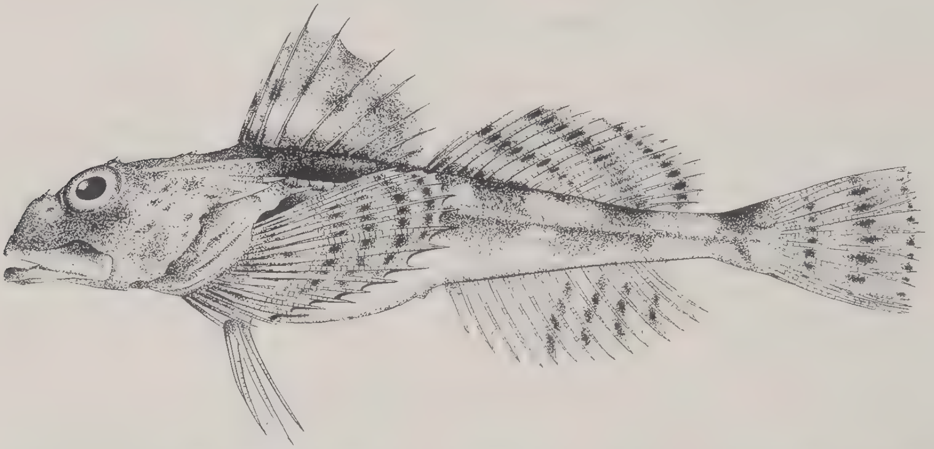
The food of the grubby includes marine worms, shrimp, crabs, copepods, snails, and other molluscs, sea squirts and the young of many species, including alewives, cunner, eels, lance, mummichogs, silversides, sticklebacks, and tomcod.[49]

Longhorn sculpin Chaboisseau à dix-huit épines

Myoxocephalus octodecemspinosus (Mitchill) 1815

OTHER COMMON NAMES: long-spined sculpin, gray sculpin

DESCRIPTION: Body elongate, rather slender, greatest depth about 5½ in total length under middle of 1st dorsal fin; posterior part of body from vent and notch between dorsal fins tapering and slender ending in a small caudal peduncle; one short, sharp spine behind upper part of gill opening. Head blunt, heavy, flattened, 3⅓ in total length, one pair of short nasal spines, one pair of spines above and behind eyes and one pair well behind these on top of head, 3 spines on preopercle, upper one at least 4 times as long as the one below it, sharp and naked at tip, middle spine short, just below long one and directed backward and slightly downward, lower one directed downward, 2 sharp spines on upper corner of gill cover; mouth terminal, low on head, angle of jaw under posterior edge of eye, small teeth on jaws and vomer. Eye 4½ in head, high on head. Fins: dorsals (2) 1st VIII–IX, first 3 spines graduated, the 3rd being longest and 2 in head, remaining spines gradually decrease in length, base 1½ in head, 2nd dorsal 15–16, somewhat rounded, not as high as spinous fin, base equals head length, no appreciable space between 1st and 2nd dorsals; caudal moderate, rounded; anal 14, slightly lower and shorter than 2nd dorsal, located under it; pectorals large, fan-like, base extending along lower ⅔ of gill opening, reaching third or fourth ray of 2nd dorsal; pelvics I, 3, rays 2¼ in head, located ventrally under middle of base of pectoral. Lateral line marked by a series of cartilaginous plates. Skin naked.



Colour, variable but usually dark-olive to pale greenish-yellow above, merging into white colour of belly; usually four obscure, irregular cross-bars that may be broken into blotches. First dorsal fin sooty with irregular mottlings; second dorsal with three or four dark cross-bars; caudal with light bars; anal with four oblique dark bars; pectoral with three dark bands.

DISTINCTIONS: The longhorn sculpin is distinguished from the shorthorn sculpin and the grubby by the long spine on the preopercle. The first dorsal fin is more rounded than in the shorthorn sculpin and the whole body is more slender than the shorthorn.

SIZE: The longhorn sculpin may reach a length of 18 inches but specimens over 14 inches long are rare.

RANGE: Coastal waters of the western North Atlantic Ocean from eastern Newfoundland and the northern Gulf of St. Lawrence to Virginia.

Canadian distribution: Reported twice from an unspecified point on the north shore of the Gulf of St. Lawrence;[155] from Cascapedia Bay, Gaspé;[229] abundant in the Miramichi estuary;[312] widely distributed between Cheticamp, Nova Scotia, and the Magdalen Islands, P.Q., down to at least 16 fathoms;[95] present in Malpeque Bay, P.E.I.,[334] and at Tignish, P.E.I.[92] Taken in Chedabucto Bay, Nova Scotia, in depths up to 17 fathoms; common in 10–50 fathoms around the Nova Scotia coast.[513] Taken in Trinity Bay and in St. Mary's Bay, Newfoundland, on Banquereau and Sable Island Bank.[17, 18, 19] Very common in shallow water throughout the Bay of Fundy and St. Mary Bay, occurring in Passamaquoddy Bay, the Annapolis Basin, and Minas Basin.[205]

BIOLOGY AND ECONOMICS: The longhorn sculpin is a year-round resident of coastal waters, moving into deeper water in cold weather and coming back again in spring. When caught it spreads its sharp spines and erects the dorsal spines and is troublesome to handle.

Spawning occurs during the winter months. The eggs are spherical, about $\frac{1}{15}$ inch in diameter and vary in colour from copper-green to orange and purple. They are adhesive and when extruded form clumps which attach to bottom, remaining there until hatched.

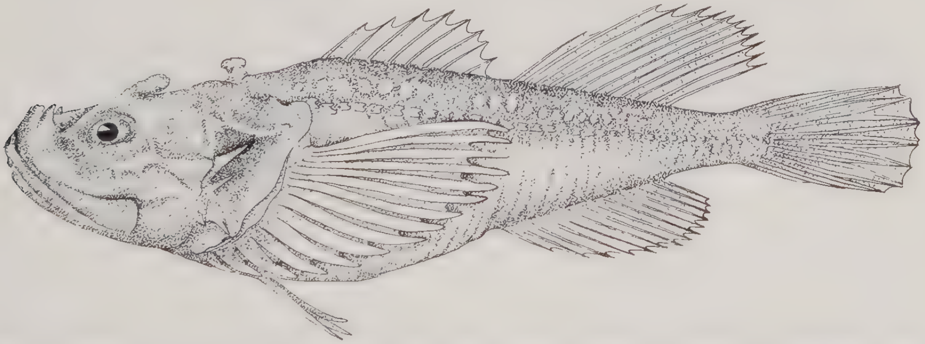
In addition to being a scavenger around wharves or wherever offal is discarded, the longhorn sculpin eats a wide variety of crabs, shrimp, molluscs, squid, sea squirts, and miscellaneous small fishes including herring, mackerel, smelt, sand lance, and silversides.

Fourhorn sculpin **Chaboisseau à quatre cornes**

Myoxocephalus quadricornis (Linnaeus) 1758

OTHER COMMON NAMES: four-spined sculpin, four-horned sea scorpion

DESCRIPTION: Body elongate, greatest depth about 6 in total length, occurring just before 1st dorsal fin, from thence tapering to a slender caudal peduncle. Head $3\frac{1}{3}$ in total length, 4 moderate spines uniformly spaced on preoperculum, upper one longest being $5\frac{1}{2}$ in head and pointing upward and backward, next one pointing backward and lower 2 pointing down; 4 spongy bony masses or crests on top of head, 2 of these between the eyes and 2 halfway between eyes and back of head, height of these crests about 8 in head, 2 spines on top of head between posterior crests and 1st dorsal fin; mouth terminal, lower jaw projecting slightly, angle under posterior edge of eye, small teeth in jaws. Eye 8 in head, located high on head.



Fins: dorsals (2) 1st VII–IX (VI–X[496]), third ray longest being 3 in head, fin rounded, base $\frac{2}{3}$ length of head, fin originates over extreme posterior part of gill opening, 2nd dorsal 13–16 (13–17[496]) fourth ray longest, being 2 in head, higher in males, base $\frac{3}{4}$ length of head, a very short gap between first and second dorsal fins; caudal large, truncate; anal 13–16 (13–17[496]), under and the same shape as 2nd dorsal but a trifle lower; pectorals large, reaching 2nd dorsal, base extends along much of gill opening; pelvics much smaller, located ventrally between pectorals. Sides of upper part of body with a series of rough modified scales running from beginning of 1st dorsal fin to base of tail, with a second row beneath the 2nd dorsal fin.

Colour, dark above, with golden-brown sides; whitish below.

DISTINCTIONS: The fourhorn sculpin can be distinguished easily from the other species by the presence of the four bony protuberances on top of the head.

SIZE: Up to a length of 10 inches.[131]

RANGE: Arctic coasts, including Hudson Bay, northern Labrador, Greenland, the White Sea, and Novaya Zemblya. Also found in the northern parts of the Baltic Sea where it is regarded as a relict of the ice ages.[131]

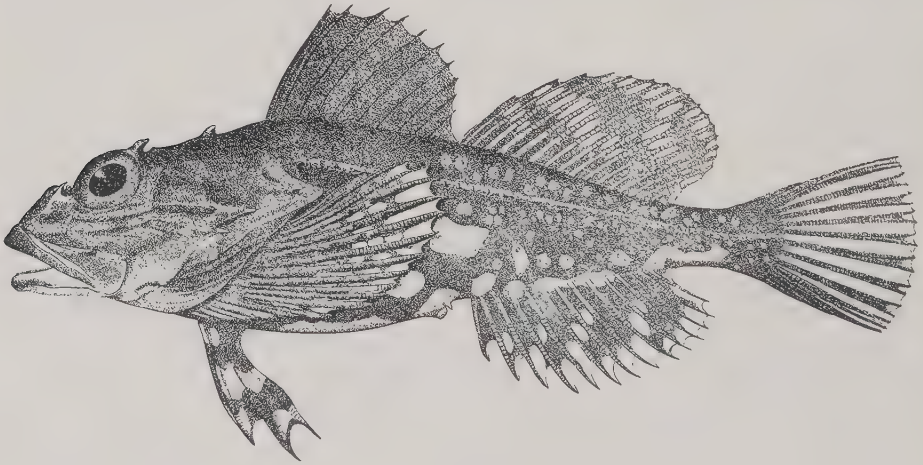
Canadian distribution: Reported from James Bay and from many points along the shores of Hudson Bay and from Hudson Strait.[35, 496, 538] On the Labrador coast it occurs at Nain (lat 56°32′N),[25] and other specimens were seined at Jerusalem Bight, near Hebron, in July 1952.[172] It has not been reported south of Nain.

Shorthorn sculpin **Chaboisseau à épines courtes**

Myoxocephalus scorpius (Linnaeus) 1758

OTHER COMMON NAMES: daddy sculpin, Greenland sculpin, crapaud de mer à courtes épines

DESCRIPTION: Body somewhat elongate, greatest depth $4\frac{1}{5}$ in total length at level of 4th ray of 1st dorsal, after which the body tapers to a moderately small caudal peduncle; 2 short thorn-like spines close behind upper corner of gill cover. Head large, about 3 in total length, flat, upper jaw slightly longer than lower, profile steep to eye level; angle of mouth under posterior edge of pupil of eye, small teeth on jaws and vomer; a longitudinal ridge on each side of top of head with one short spine before the eyes and 2 behind them, each cheek with 5–7 bluntish spines between snout and gill opening, the upper one less than twice as long as the one below it; a short sharp spine at the upper corner of each gill cover. A small slit pierces the soft skin low on the side of the throat behind the last gill arch. Eye large, 5 in head, high



on head. Fins: dorsals (2) 1st IX–XI, first spines all high about $2\frac{1}{2}$ in head, the last 4 or 5 rapidly shortening, base of fin $1\frac{2}{3}$ in head, 2nd dorsal 15–19,[25] its middle rays slightly longer than spinous fin, extending from end of 1st dorsal to caudal peduncle, its base $1\frac{1}{2}$ in head; caudal moderate, evenly rounded; anal 12–16,[25] not quite as high as dorsal fins, located under 2nd dorsal whose base length it equals; pectorals large, fan-like, base extending along much of edge of gill opening, tip reaching level of gap between dorsal fins; pelvics I, 3, length about 2 in head located under anterior and lower part of pectorals. Lateral line high on body. Two series of prickly plate-like scales, one above and one below the lateral line.

Colour, dark greenish-brown above with broad darker bars and mottling; yellowish on under side, males with large pale spots; back and top of head with grayish blotches; fins brown, greenish or yellow, spotted and barred. Colour variable.

DISTINCTIONS: The shorthorn sculpin is distinguished from the longhorn sculpin by its short upper spine on the preopercle, this spine not being more than twice as long as the spine below it. Small shorthorn sculpins are distinguished from the grubby by the anal rays which number 12–16 as compared to 10–11 in the grubby.

SIZE: While the shorthorn sculpin is reported to reach a length of 3 feet, specimens over 20 inches long are rare.

RANGE: On both sides of the North Atlantic Ocean and in the arctic where it is found from Alaska through to Hudson Bay and Baffin Island and south to New York. Found at Greenland, Iceland, Spitzbergen, Nova Zembla, Siberia, and northern Europe south to the Bay of Biscay.

Canadian distribution: Known in arctic Canada from Dolphin and Union Strait, Baffin Island, and in Ungava Bay;[124, 445] Bathurst Inlet and Bernard Harbour, Northwest Territories;[517, 518] from many points in James and Hudson bays and at Nottingham Island;[496] Cumberland Gulf.[33] From the entire Labrador coast.[25, 240, 451] From Raleigh, Newfoundland;[209] from Torbay and Conception Bay, Nfld.;[228] from St. Anthony, St. Julien, and Quirpon, Nfld.; at Blanc Sablon, Labrador.[17, 18, 19] Reported in the Gulf of St. Lawrence from Trois Pistoles, Quebec region;[514] at Anticosti Island, Que.;[405] at Gaspé;[450] in Miramichi Bay, [93, 312] and as larvae only at stations near the Magdalen Islands, Que.[102] Very common at Canso, Nova Scotia;[91] very common around the coast of Nova Scotia.[513] Offshore it has been reported from Banquereau.[17, 19] Very common throughout the Bay of Fundy, including St. Mary Bay and Annapolis Basin; not found in Minas Basin.[205]

BIOLOGY AND ECONOMICS: Although usually seen in cool, shoal water of up to 20 fathoms, or as a scavenger around wharves, the shorthorn sculpin has been caught in 57 fathoms near the Strait of Belle Isle.[17] It is a sluggish, bottom-seeking fish.

Food consists of crabs, shrimp, sea urchins, marine worms, and other organic material.

This sculpin spawns in late winter or early spring in the north. The eggs are large, about $\frac{1}{12}$ inch in diameter. They are reddish or yellowish and are deposited on bottom in spongy masses, several inches thick.

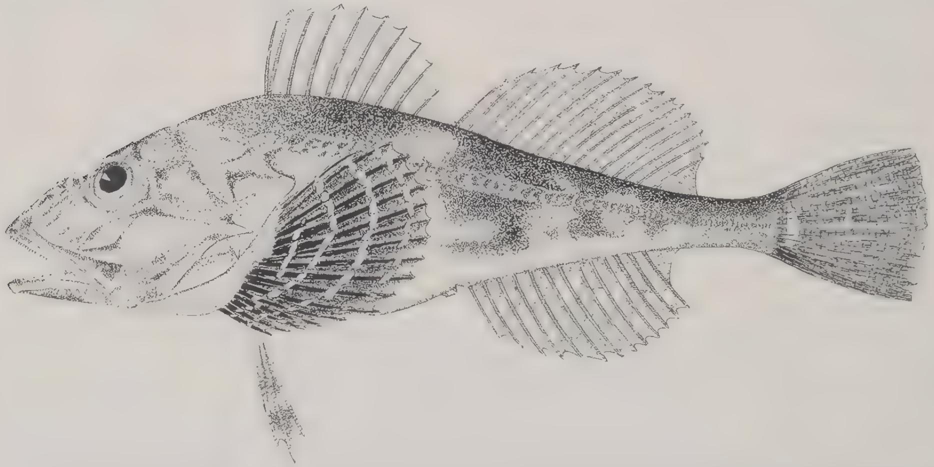
The shorthorn sculpin sometimes was used as lobster bait but that practice has declined.[49]

Arctic sculpin **Chaboisseau arctique**

Myoxocephalus scorpioides (Fabricius) 1780

OTHER COMMON NAMES: kanayuk

DESCRIPTION: Body stoutish, depth 4½ in total length, tail slender. Head moderate, 3 in total length, warty prominences on top of head including interorbital space, fleshy tabs rather than spines on top of head, these sometimes obsolete; 3 short preopercular spines, length of upper one equals diameter of eye, others shorter, last one directed downward; angle of mouth under middle of eye. Eye large. Fins: dorsals (2) 1st VIII–X, second 15–17; caudal truncate; anal 10–13; pectorals 14–16, reaching to the front of the anal fin. Pelvics reduced, between pectorals. Lateral line complete and straight except for an abrupt downward bend on the caudal peduncle.[25] Skin nearly smooth, sometimes a few wart-like prominences above lateral line.



Colour, dark olive, finely mottled with light markings; fins dusky with paler spots; anal with two oblique dark bars; a pale blotch at base of caudal.

DISTINCTIONS: The arctic sculpin is characterized by: the upper head spines being modified into soft fleshy tabs; the warty prominences on the head; the pelvic fins not reaching the vent; the pectoral fins just reaching the beginning of the anal fin; the number of rays in the pectoral fin not exceeding 16, whereas the shorthorn sculpin has 17–18 rays; and the snout is considerably narrower and sharper than in the shorthorn sculpin.[124]

SIZE: Up to a length of 8¼ inches.[25]

RANGE: North American arctic and subarctic seas; from the coast of Greenland and Baffin Island south to the Strait of Belle Isle. West along the arctic coast of Canada to Union and Dolphin Strait.

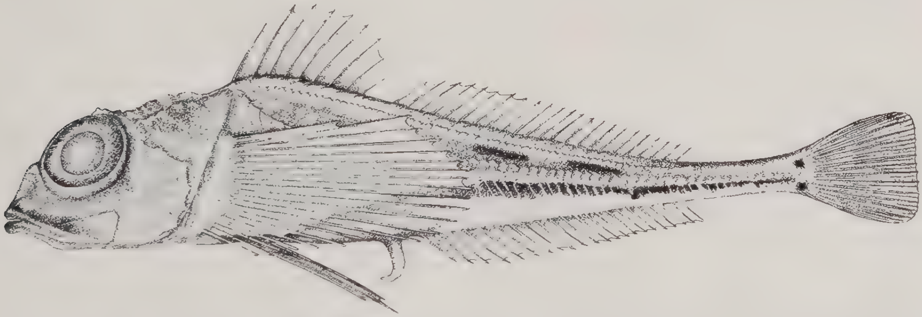
Canadian distribution: Specimens have been reported from Bernard Harbour and at Stapylton

Bay, Dolphin and Union Strait, N.W.T.[518] Found in James Bay and in Hudson Bay at Cape Merry Peninsula; Hudson Strait; Wakeham Bay and Diana Bay.[496] Reported as common in shoal water all along the Labrador coast[451] and more specifically at Nain Harbour, Turnavik Island, and Red Bay, Labrador;[25] also at the head of Jerusalem Bight, Labrador.[172]

Nybelin's sculpin **Faux-trigle de Nybelin**

Triglops nybelini Jensen 1944

DESCRIPTION: Body elongate, greatest depth 6 in total length, at beginning of 1st dorsal fin, tapering from there to a slender caudal peduncle; body roughly circular in cross-section. Head 4 in total length, pointed, somewhat compressed; 4 small, simple, preopercular spines; one pair of small spines dorsally in front of eyes; mouth low on head, its angle under middle of pupil, small teeth in jaws and on vomer. Eye large, 2½ in head, placed high on head. Fins: dorsals (2), 1st IX–XI, rounded, fourth to sixth rays longest, almost 2 in head, originating above gill opening, base length 2 in head, 2nd dorsal 24–28, lower than 1st dorsal, separated from 1st dorsal by a short space and ending on caudal peduncle, length of base 2½ times that of 1st dorsal; caudal moderate, somewhat truncate; anal 24–28, under and similar in size and shape to 2nd dorsal; pectorals 20–22 (rarely 19), large, almost equalling length of head and overlapping the anal, base just behind gill opening; pelvics 3, middle ray longest, almost 1½ in head, located ventrally slightly behind base of pectorals. Lateral line present. A row of about 45 plate-like scales along the lateral line; the skin below gathered in oblique, transverse folds.



Colour, "On the side and down towards the belly 2 rows of dark spots, partly united into 2 oblique longitudinal stripes. A dark spot above and below at the end of the tail . . . in large females . . . rows of large spots on the lower rays of the pectoral fins."[220]

DISTINCTIONS: Nybelin's sculpin closely resembles the mailed sculpin but can be easily distinguished. The pectoral fin rays are 20–22 in Nybelin's sculpin and 16–19 in the mailed sculpin. The eye is larger in Nybelin's sculpin.

SIZE: Up to 6½ inches long.[220]

RANGE: This species has been found only along the east and west coasts of Greenland and at Jan Mayen in depths of 125–500 fathoms;[220] and very occasionally in Ungava Bay and on the Labrador coast.

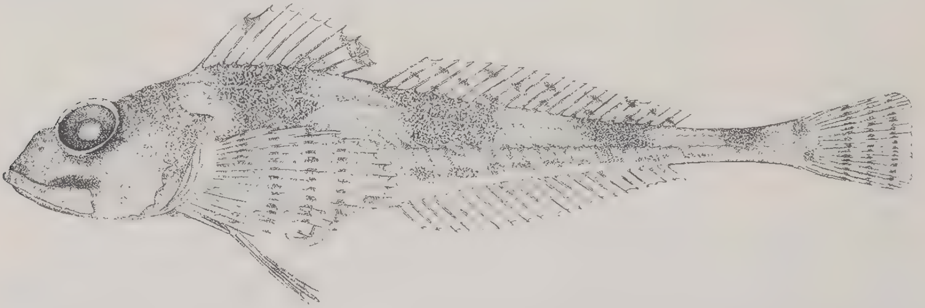
Canadian distribution: One small specimen, 1 inch long, was taken near Akpatok Island in Ungava Bay, August 24, 1949.[124] The only other known place of capture is Hebron Fjord, Labrador (lat 58°10′N), where one specimen was taken August 9, 1949.[23] The specimen reported by Gordon and Backus[172] has been reidentified as *T. murrayi.*

BIOLOGY AND ECONOMICS: This is an arctic species that lives in very cold water. Specimens taken in Greenland waters in June were mostly spent. Some contained a few eggs that were about ⅛ inch in diameter.[220]

Mailed sculpin **Faux-trigle maillé**

Triglops murrayi Günther 1888*

DESCRIPTION: Body rather elongate, greatest depth 6 in total length, at level of 4th ray of 1st dorsal, tapering from just behind head to a slender caudal peduncle; body roughly circular in cross-section. Head 4 in total length, pointed, somewhat compressed; 4 small, simple preopercular spines, otherwise head lacks spines, although somewhat prickly; mouth low on head, giving whole fish an almost straight ventral profile, upper jaw projecting, angle of mouth under pupil of eye, small teeth in jaws and on vomer. Eye large, 3 in head, located high on head. Fins: dorsals (2), 1st IX–XII, rounded, 4th and 5th spines longest being 3 in head, fin originates over gill opening, its base ⅔ length of head, 2nd dorsal 20–26, longest rays 3¾ in head, fin separated from 1st dorsal by a space equalling length of shortest rays, base twice as long as that of 1st dorsal, fin ending on caudal peduncle; caudal moderate, rounded;



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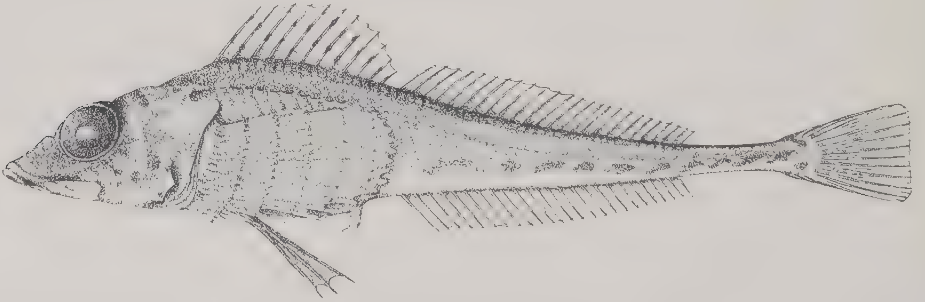
* *Triglops pingeli* Reinhardt 1832, the ribbed sculpin, faux-trigle barde, is a species distinct from *T. murrayi* but the two forms have been much confused. The information given here applies particularly to *T. murrayi,* but because of the frequent misidentification a separate account has not been prepared for *T. pingeli. Triglops murrayi* is the more common form, especially in the southern part of the Canadian region. To distinguish the three species of *Triglops* see the Key given on page 345.



anal 20–27, length of rays intermediate between spinous and soft dorsals, base slightly shorter than 2nd dorsal, fin ending under 4th last dorsal ray; pectorals large, rounded, reaching to anal fin, base immediately behind gill opening; pelvics 3, last ray longest, being 2½ in head, located near ventral edge, slightly behind base of pectoral. Lateral line present. A row of about 45–49 broad plate-like scales along lateral line on each side, with smaller, spiny scales below dorsal fins; the skin on the lower sides gathered in obliquely transverse folds. Anal papilla large in males.

Colour, olive above; white, yellowish or orange below. Four dusky blotches above lateral line on each side, one on caudal peduncle, one passing through first dorsal fin and two passing through second dorsal fin. Fins variously marked with yellowish and gray-black. Males with dark blotches on first dorsal; females with narrow lines of dots on second dorsal.[49]

DISTINCTIONS: The mailed sculpin is distinguished by the plate-like scales along the lateral line and by the large number of rays in the anal fin (twenty or more). It is distinguished from *Triglops nybelini* by the spotting on body and fins and the smaller number of rays in the pectoral fin.

SIZE: The mailed sculpin is small, reaching a length of 6–8 inches.[49, 496]

RANGE: The mailed sculpin ranges from Cape Cod on the American coast[49] northward to Ungava Bay, Greenland, Iceland, and the Atlantic coast of Europe.[291b] (*T. ommatistius* Gilbert is a synonym of *T. murrayi.*)

Canadian distribution: West of Cockburn Point, Dolphin and Union Strait, Northwest Territories, in 10–15 fathoms;[518] 3 specimens recorded from Hudson Bay in 1930;[496] many specimens from Ungava Bay, chiefly from cod stomachs;[124] one small specimen, slightly over 1 inch long from Lake Harbour, Baffin Island, in 1939.[122] Jones Sound, near Devon Island.[212] From numerous points on the Labrador coast from lat 59°24′N, long 64°01′W, to the Strait of Belle Isle in 10–60 fathoms.[25] In the Gulf of St. Lawrence it has been reported from off Trois Pistoles, Quebec;[357, 514] from a cod stomach off Cape George, Nova Scotia in 45 fathoms;[240] from cod stomachs and in trawls, off Cheticamp, Nova Scotia.[95] From the Grand Bank generally and from off St. Pierre, St. Georges Bay, St. Marys Bay, off Conception Bay, Sandwich Bay, and St. Anthony, Newfoundland.[17, 18, 19] From the Bras d'Or Lakes, Nova Scotia, in 40 fathoms, collected by Dr D. M. Scott, in 1953; from Chedabucto Bay, Nova Scotia, in 18 fathoms.[61] Common on Sable Island Bank taken in cod stomachs.[513] From trawl hauls in 15 fathoms in Passamaquoddy Bay, New Brunswick.[205]

BIOLOGY AND ECONOMICS: Little is known of the life history of the mailed sculpin. A ripe female was found in the Gulf of St. Lawrence in July, indicating summer spawning; the eggs were pinkish, $\frac{1}{12}$ inch in diameter and contained many oil globules.[95] Females in like condition were observed in Hudson Bay at the end of August.[496] The sexes are readily distinguished, the male having a prominent anal papilla and longer fins.

Family AGONIDAE   Poachers and alligatorfishes

These are small, slender fishes, closely related to the sculpins (Cottidae) but different from them in that the body is completely covered with bony plates or shields providing a complete and effective armour; there may be either one or two dorsal fins, and the pelvic fins are thoracic in position. The bony shields are smooth and arranged more or less in longitudinal rows in such a way as to produce longitudinal ridges along the length of the body.

There are many species in the family, a large number of these occurring in more northerly seas, especially in the Pacific Ocean. They are bottom-living fishes and some species are said to inhabit depths to around 700 fathoms, although most live in shallower water. Three species are known to occur in our area.

KEY to Family AGONIDAE

1 Two dorsal fins; 5 pairs of barbels about mouth .... Atlantic sea poacher, *Agonus decagonus* (p. 364)
A single dorsal fin; mouth with one pair of barbels, or none 2

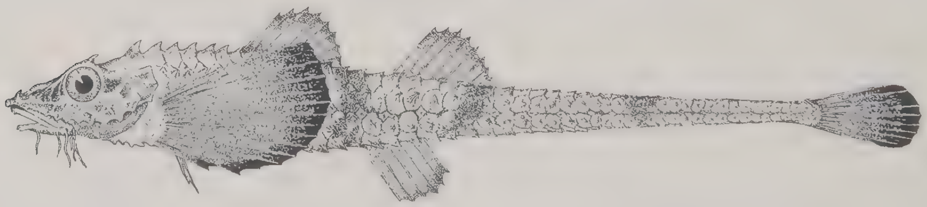
2 Barbels absent; body slender; dorsal plates in 46–49 rows .... Alligatorfish, *Aspidophoroides monopterygius* (p. 365)
One pair of barbels at corner of mouth; body short and stout; dorsal plates in 35–38 rows .... Arctic alligatorfish, *Aspidorphoroides olriki* (p. 366)

Atlantic sea poacher — Agone atlantique

Agonus decagonus Bloch and Schneider 1801

Other common names: northern alligatorfish, sea poacher

Description: Body elongate, greatest depth 8 in total length, just before 1st dorsal, tapering gradually to behind 2nd dorsal, then almost uniform to base of caudal fin; forward part of body octagonal, tail portion hexagonal, longitudinal rows of 45–48 bony plates covering body, some rows converging and merging behind 2nd dorsal fin, anterior plates of the dorsal and ventral rows with strong keels or spines. Head 5 in total length, broad, its width 6 in total length, 1 pair of spines near nose, 1 pair above eyes, and 1 pair behind eyes; 3 blunt spines on gill cover; upper jaw projecting; mouth inferior, its angle under anterior edge of eye, small teeth on both jaws; 4 simple and 1 branched barbels attached to lower jaw and posterior part of upper jaw, their length equalling eye diameter or more. Eye large, 4½ in head. Fins: dorsals (2) 1st V–VIII,[25] first spines longest being 3 in head, located opposite middle of pectorals, base ⅔ length of head, 2nd dorsal 5–8,[234] similar in size and shape to 1st dorsal and separated from it by ½ its base length; caudal rounded, moderate; anal 5–8,[132] similar in height to dorsals, located slightly in front of 2nd dorsal; pectorals 14–17, large, base covers lower half of body a short distance behind gill opening, longest rays equal head



length, rounded; pelvics I, 2, small, located ventrally between bases of pectorals, rays ½ length of pectorals, longer in males than in females.[25] Lateral line present.

Colour, yellowish-gray with 2 or 3 large grayish-brown patches, forming indefinite cross-bands, the first above base of pectorals, second under posterior part of first dorsal and third under middle of second dorsal; pectoral and caudal fins brownish-black toward tips; under side similar to back; a broad black band across head from tip of snout through eye.[234]

DISTINCTIONS: The Atlantic sea poacher is distinguished from the alligatorfishes by its two dorsal fins, as against their one. There is little likelihood of confusing it with anything else. A closely related European species has not been found in our area; its head bears a profuse group of barbels.

SIZE: Up to a length of 8¼ inches.[132]

RANGE: An arctic species known from Baffin Island to the Laurentian Channel, and occasionally south of it; on the Grand Bank; at Greenland, Iceland, Faroes, Spitzbergen, and northern Norway.

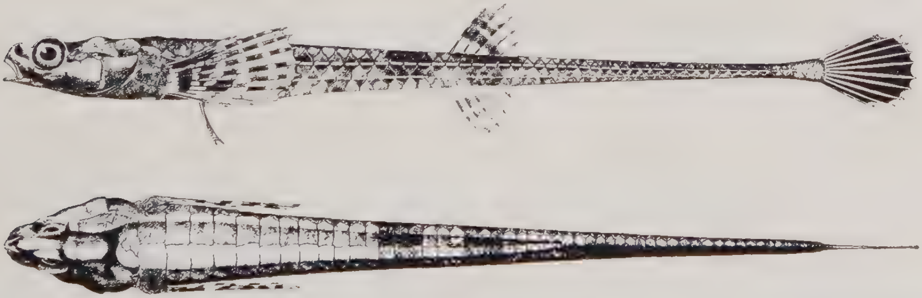
Canadian distribution: The Atlantic poacher is reported as frequent at Lake Harbour, Baffin Island;[122] from the Labrador coast, in 15–125 fathoms, from St. Lewis Sound (lat 52°21′N) to Hebron Fjord (lat 58°09′N).[18, 25] In the Gulf of St. Lawrence from the Trois Pistoles, Que. region;[494] from off Fox River, Que., in 130–160 fathoms;[454] from Orphan Bank as a pelagic larva; [102] from off Margaree Harbour, N.S. Taken in Fortune Bay, off St. Julien, in White and Conception bays, Nfld., and over the Grand Bank generally; also reported from eastern Banquereau[17, 18, 19] and from west of Middle Bank (lat 44°15′N, long 60°55′W).[313]

Alligatorfish **Poisson-alligator atlantique**

Aspidophoroides monopterygius (Bloch) 1786

OTHER COMMON NAMES: sea poacher, aspidophore, poisson-alligator

DESCRIPTION: Body elongate, slender, greatest depth 15 in total length, occurring at base of pectoral fin, posterior ⅓ of body very slender but slightly enlarged towards base of caudal fin; entire head and body covered with bony plates, anteriorly on the body these are arranged



in 8 longitudinal rows but the dorsal and ventral rows converge so that there are only 6 rows behind vent; cross-section of body octagonal anteriorly, hexagonal posteriorly. Head 6½ in total length, somewhat depressed, mouth terminal, small, angle in front of eye, minute teeth on jaws, vomer, and palatine. Eye 4½ in head. Fins: dorsal (1) 5–6, longest rays 2½ in head, base 2 in head, located midway between snout and tip of tail; caudal moderately large, rounded; anal 4–6,[25] similar in size to and located under dorsal; pectorals are largest fins, located on sides a short distance behind gill opening, rays equalling head length; pelvics small, I, 2, located ventrally under anterior ⅓ of pectorals, longer in males than in females.[25] Lateral line present.

Colour, dark brown above, lighter below, with two dark cross-bands between pectorals and dorsal fin and two or three dark bands between dorsal and caudal fins; dorsal and pectoral fins with dark cross-bars. Some milky-white on anals.[25]

DISTINCTIONS: The slender form and armoured plates distinguish the alligatorfish at a glance. It may be distinguished from the Atlantic poacher (*Agonus decagonus*) by its single dorsal fin, *Agonus* having two such fins. Its closest relative is the arctic alligatorfish (*Aspidophoroides olriki*). The present species has over 40 plates in the lateral line while the arctic species has 40; in addition the former has a shorter head and a longer and more slender body.

SIZE: Up to a length of 7 inches.

RANGE: From West Greenland and the coast of Labrador south to Cape Cod, straying to New Jersey; in depths of 10–105 fathoms.

Canadian distribution: Taken frequently on the Labrador coast between Nain (lat 56°33′N) and Hamilton Inlet.[25, 240] Frequent in the deeper parts of the Gulf of St. Lawrence;[204] reported from Trois Pistoles region, Que.;[357, 511] as a larva under 1 inch near Cape Gaspé;[102] from Miramichi Bay;[312] from the Magdalen Islands.[95] From Chedabucto Bay, N.S.,[91] and common on the outer coast of Nova Scotia.[513] From the Grand Bank generally, and from Quirpon and Port-au-Port Bay, Nfld.[17, 18, 19] Occasional in the Bay of Fundy including Passamaquoddy Bay where it also occurs in larval stages.[205]

Arctic alligatorfish — Poisson-alligator arctique

Aspidophoroides olriki Lütken 1876

DESCRIPTION: Body somewhat elongate, greatest depth 6½ in total length, caudal peduncle small; 8 longitudinal rows of plates on fore part of body, 6 rows on tail portion, 36–38 plates in dorsal series. Head 4⅓ in total length, forehead strongly arched; mouth small, terminal, angle in line with anterior edge of eye, small teeth on jaws, vomer, and palatines. Eye large, 3 in head. Fins: dorsal (1) 5–7,[25] situated about midway between head and caudal fin; caudal moderate, rounded; anal 5–7, situated under dorsal; pectorals 13–15,[231] large, about equal to head length, situated a short distance behind gill openings; pelvics small, situated ventrally, slightly behind base of pectorals. Lateral line present.

Colour, uniform dark-gray to greenish on back; several indefinite dark cross-bands on sides; a large dark patch on gill cover and on pectoral and caudal fins; tips of dorsal, anal, and pelvic fins milky-white in males.[25]

DISTINCTIONS: This fish is shorter and stouter than the alligatorfish (*A. monopterygius*), having a depth of 6½ in total length against 15 in total length for the alligatorfish. It has fewer body plates than the other species.

SIZE: Up to a length of 3 inches.[25]

RANGE: An arctic form known from Hudson Bay, Labrador, Greenland, Barents Sea, Nova Zembla, Kara Sea, and the coast of Alaska.[122]

Canadian distribution: A few specimens, under 1 inch long, were reported from the southwestern part of Hudson Bay, off Cape Tatnam, Manitoba;[406] adults and larvae were taken in Ungava Bay;[124] Baffin Island;[122] reported frequently along the Labrador coast, in 10–60 fathoms, from St. Lewis Sound (lat 52°22′N) to Kangalaksiorvik Fjord (lat 59°24′N).[25]

Family CYCLOPTERIDAE — Lumpfishes and seasnails

These are mostly small and generally stout-bodied fishes of northern seas with the pelvic fins modified to form an adhesive disc. The body may be somewhat elongate and naked and shaped like a tadpole, or thickset and stout-bodied and more or less covered with conical tubercles of varying sizes, presenting at times a very effective armour. There may be one or two dorsal fins, caudal fin may be distinct or confluent with the dorsal and the anal fins, and the pectoral fins have a long base and are many-rayed. The pelvics are thoracic and modified to form an adhesive disc, permitting these small fishes to perch, bird-like on bottom rocks.

Thirteen species divisible into lumpfishes and seasnails, have been reported to occur in our area.

KEY to Family CYCLOPTERIDAE

1 Two dorsal fins; skin usually with conical tubercles; caudal fin distinct from dorsal and anal fins (lumpfishes) 2
A single, long dorsal fin; skin naked; caudal fin usually confluent with dorsal and anal fins (seasnails) 4

2 Gill openings large, extending to below top of pectoral fin base .... Lumpfish, *Cyclopterus lumpus* (p. 368)
Gill openings small, not extending downward to base of pectoral fin 3

3 Chin and pectoral fin base without tubercles; no tubercles between dorsal fins .... Leatherfin lumpsucker, *Eumicrotremus derjugini* (p. 370)
Chin and pectoral fin base with tubercles, usually one or 2 spines between dorsal fins .... Atlantic spiny lumpsucker, *Eumicrotremus spinosus* (p. 371)

4 Adhesive (pelvic) disc absent .... Blacksnout seasnail, *Paraliparis copei**
Adhesive (pelvic) disc present 5

5 Nostrils with a single opening (*Careproctus*) 6
Nostrils with a double opening 7

6 Diameter of adhesive disc smaller than eye diameter .... Longfin seasnail, *Careproctus longipinnis* (p. 373)

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* Schroeder[414] reported captures of *Paraliparis copei* Goode and Bean 1896, from off Nova Scotia and Georges Bank in depths in excess of 200 fathoms. It has also been taken off Greenland in Davis Strait and off United States waters. A detailed account of the species has not been prepared.

Diameter of adhesive disc larger than eye diameter ....
.... Sea tadpole, *Careproctus reinhardi* (p. 374)

7 Peritoneum black; anal fin rays 37–41 ....
.... Gelatinous seasnail, *Liparis koefoedi* (p. 377)

Peritoneum not black; anal fin rays 37 or fewer 8

8 Anal fin rays 32 or more; dorsal fin rays 40 or more 9

Anal fin rays 30 or less; dorsal fin rays less than 40 10

9 Pectoral fin rays 39–43; gill slit extending downward in front of more than 10 pectoral fin rays .... Polka-dot seasnail, *Liparis cyclostigma* (p. 376)

Pectoral fin rays 35–38; gill slit extending downward in front of 6 or fewer pectoral fin rays .... Greenland seasnail, *Liparis tunicatus* (p. 378)

10 Pectoral fin rays 26–28; dorsal fin rays 32–35; pyloric caeca 19–37 ....
.... Atlantic seasnail, *Liparis atlanticus* (p. 374)

Pectoral fin rays 32 or 33; dorsal fin rays 34 or 35; pyloric caeca 10–13 ....
.... Striped seasnail, *Liparis liparis* (p. 378)

Lumpfish — Grosse poule de mer

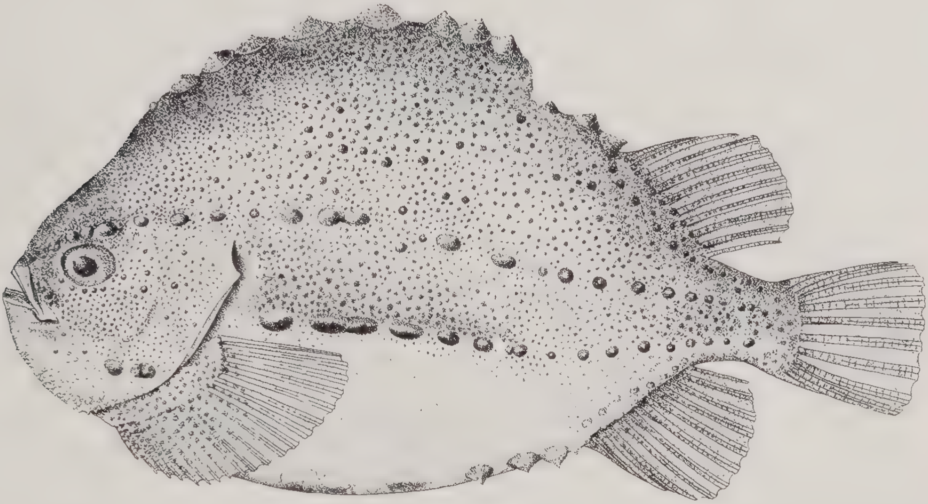
Cyclopterus lumpus Linnaeus 1758

OTHER COMMON NAMES: henfish, lump, lump-sucker, poule l'eau

DESCRIPTION: Body stout, thick, greatest depth 2 in total length about halfway between snout and base of caudal; a partly cartilaginous, partly gelatinous hump on the back engulfing the first dorsal fin in adults and making the cross-section of the body roughly triangular; scaleless but covered with hard, wart-like tubercles of various sizes, the larger ones disposed in 7 rows, 1 along the middle of the back, surmounting the hump, and 3 rows on either side, 1 of these extending from tip of upper jaw and above the eye to the upper part of caudal peduncle, 1 from above pectoral fin to lower part of caudal peduncle, and 1 along the edge of the flattened ventral surface; caudal peduncle rather small, ⅕ maximum depth of fish, and rounded slightly. Head 4 in total length, lower profile convex, upper profile almost straight; mouth small, terminal, angle in front of eye; small, simple teeth in single row in jaws. Eye 4 in head. Fins: dorsals (2), 1st VI–VIII, visible only in small specimens of 1¼ inches or less, incorporated in the hump in larger specimens, 2nd dorsal 10–11, third to sixth rays longest being a little over ½ length of head, located behind hump and ending at caudal peduncle, base equals ⅔ of head length; caudal moderate, rounded slightly; anal 9–11, under and similar in size to 2nd dorsal; pectorals large, 20–21, base extending along lower ⅔ of gill opening, length of upper rays equalling those of 2nd dorsal, lower ones slightly shorter, fin larger in males than in females; pelvics located on ventral side between bases of pectorals, modified to 6 pairs of fleshy knobs surrounded by a circular flap of skin, thus forming a sucking disc. Lateral line not apparent.

Colour, variable, often matching the environment, especially in the young. Tints cover a range from blue, bluish-gray to greenish and brownish; belly often yellowish or whitish, except in breeding males when it is red, brightest near sucking disc.

DISTINCTIONS: The lumpfish is distinguished by its stout form and the dorsal hump and tuberculated, rough skin. It is distinguished from the Atlantic spiny lumpsucker by its apparently single dorsal fin, the spinous dorsal not being obscured in the Atlantic spiny lumpsucker. The eye of the lumpfish is relatively much smaller than that of the Atlantic spiny lumpsucker; the skin tubercles are relatively much smaller in the lumpfish and they cover the skin less completely than in the spiny lumpsucker.



SIZE: A female lumpfish weighing 21 pounds, 4 ounces, and measuring 23.5 inches long, is recorded by Gordon.[171] This particular specimen contained an estimated 279,620 eggs. European specimens have reached a length of 24 inches.

RANGE: Both sides of the North Atlantic Ocean; in Hudson Bay; on the Labrador Coast and south to New Jersey, straying to Chesapeake Bay.[49] At East and West Greenland, Iceland, Faroes, White Sea, and Murman Coast south to the British Isles and to Gascoyne Bay, France.[220]

Canadian distribution: Hudson Bay;[99, 196] James Bay;[99] at Chimo, Ungava Bay;[210] Hamilton Inlet and West Turnavik Island, Labrador (lat 55°15′N),[25] Nutak Harbour, Labrador (lat 57°30′N);[172] Strait of Belle Isle.[18, 19, 209, 339, 455, 523] In the Gulf of St. Lawrence at Anticosti;[405] Trois Pistoles, Que.;[139] Gaspé;[450] Miscou Island, N.B.;[99] Miramichi estuary;[93, 312] Magdalen Islands;[95] Cheticamp, N.S., area.[95, 526] Around Newfoundland at Cape Cormorean;[240] off Port-au-Port Bay; off Conception Bay; at Bay Bulls and Ferryland, Avalon Peninsula; at Fortune Bay and St. Pierre.[17, 19] On the outer coast of Nova Scotia, reported as plentiful at Canso, N.S.;[92] common on the coast generally;[99, 232, 513] off Cape Sable.[240] Abundant in the Bay of Fundy including St. Mary and Passamaquoddy bays, up to Saint John on the New Brunswick side and to Canada Creek on the Nova Scotia side.[93, 205, 348]

BIOLOGY AND ECONOMICS: Adult lumpfish are primarily bottom fish, living on rocky and stony bottom but frequently are semipelagic, hiding under floating seaweed. Often they adhere to stones, lobster traps, etc. by means of the sucker-like pelvic fins.

Their food consists of euphausiid shrimp, pelagic amphipods, other small

Crustacea, bits of jellyfish, comb jellies, and some small fishes, such as herring and sand lance.[99]

Lumpfish are eaten in some quantity by seals.

Spawning takes place in shallow water, and perhaps also in greater depths, over a lengthy period. Small larvae have been found in the Gulf of Maine in early May, but egg masses almost ready to hatch have been found in St. Mary Bay in early June and as late as July 8. More recently egg masses were found in the same locality in mid May. An egg mass was found near Cheticamp, N.S., in late June.[99]

The eggs are found in large spongy masses adhering to rocks among seaweed. Individual eggs are about ⅒ inch in diameter, pale green to yellowish, becoming darker as development proceeds. Large females will produce 140,000 eggs. The period of incubation varies from 6 weeks to 2 months. During this period the male guards the eggs.

Lumpfish reach a length of about 4 inches in their 3rd year and about 10 inches in their 5th year.[99] Growth can be accelerated by adequate feeding in aquarium conditions; one was known to grow from a length of 4 inches to 12 inches in 1 year.[304]

In North America lumpfish have only been used as food for dogs.[209] However, they have been used for human consumption in Iceland, Germany, Denmark, and Sweden to the extent of several million pounds annually.[94] The flavour is said to be excellent.

Leatherfin lumpsucker — Petite poule de mer arctique

Eumicrotremus derjugini Popov 1926

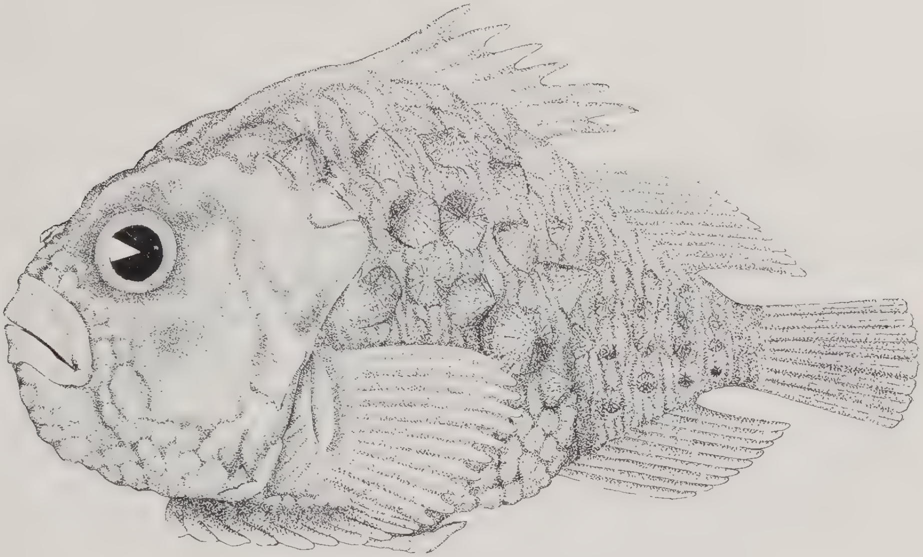
DESCRIPTION: Body short, deep, stout anteriorly, compressed posteriorly, greatest depth 2⅕ in total length, occurring at posterior edge of gill cover, body then tapering to a small caudal peduncle; much of head and body covered with small bony tubercles that lack any orderly arrangement,[354] no tubercles on chin. Head bluntly rounded, 3 in total length, profile steep; mouth terminal, small, angle in front of eye, lips thick, small, subconical teeth in jaws, no barbels on chin. Eye small.[329] Fins: dorsals (2), 1st VII, longest rays 2 in head, fin entirely covered by skin,[354] base about ⅔ of length of head, origin just behind posterior tip of gill cover, 2nd dorsal 11–13, middle rays longest, about 3 in head, a space between the 2 dorsals, 2nd ending on caudal peduncle; caudal medium, rounded; anal 10–12, a little higher than 2nd dorsal and slightly in front of it; pectorals moderate, longest rays a little over half head length, situated low on sides, base usually without bony tubercle; pelvics modified into a small ventral sucker with thickened edges, far from vent.[329] Lateral line not apparent.

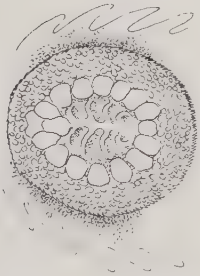
DISTINCTIONS: The leatherfin lumpsucker differs from the Atlantic spiny lumpsucker (*E. spinosus*) in having the first dorsal fin covered by skin, and by the absence of bony tubercles on the chin. The eye is smaller and so is the sucking disc.

SIZE: Up to 3½ inches in length.[496]

RANGE: An arctic species found in Hudson Bay and Strait and rarely on the

Labrador coast. Occurs in the Barents, Kara, and Nordenskiold seas and in the Sea of Okhotsk.[354]





Canadian distribution: Reported frequently from Hudson Bay and from the stomachs of cod caught in Ungava Bay.[496] A single specimen 2½ inches long found at Saglek Bay, Labrador.[25, 191]

Atlantic spiny lumpsucker — Petite poule de mer atlantique

*Eumicrotremus spinosus** (Müller) 1777

DESCRIPTION: Body short, deep, stout anteriorly, compressed posteriorly, greatest depth 2⅕ in total length occurring at posterior edge of gill cover, body then tapering to a small caudal peduncle; surface of entire body, including head, studded with rough tubercles, the largest ⅔ diameter of eye, the smallest much less. Head bluntly rounded, 3 in total length, profile steep; mouth terminal, small, angle considerably in front of eye, lips thick, small, subconical teeth in the jaws. Eye large, 3 in head, located high on head. Fins: dorsals (2) 1st VI–VII,[25] second ray longest being 2 in head, fin triangular, base length about ⅔ of head length, situated just behind posterior tip of gill cover, sometimes imbedded in heavy skin but not concealed, 2nd dorsal 10–12,[25] middle rays longest, being 3 in head, base 2 in head, a space between dorsal fins, the 2nd ending on caudal peduncle; caudal small, rounded; anal 10–12,[25] a little higher than 2nd dorsal and very slightly in front of it; pectorals moderate, longest rays a little over half of head length, situated low on sides, a short distance behind head; pelvics situated ventrally between pectorals, modified into a sucker with thickened edges. Lateral line not apparent.

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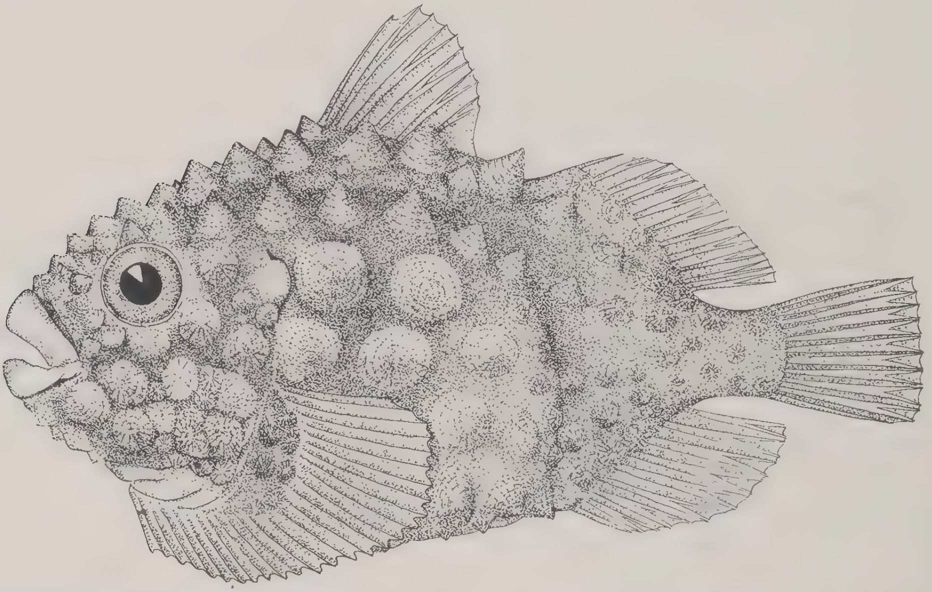
* Myers and Böhlke[329] describe a new species, *E. terrae-novae,* based on a single specimen in the Stanford University Museum. It was caught in 1885 at lat 46°09½′N, long 49°48½′W, on the northeastern part of the Grand Bank in 39 fathoms. This alleged species has smaller and more numerous tubercles on the head and body, but otherwise it seems to agree with *E. spinosus.* The authors admit in a footnote that they had not seen Jensen's[220] paper until theirs was ready for press. Jensen indicates variability in *E. spinosus. Eumicrotremus terrae-novae* has been omitted until more convincing evidence of its validity appears.



Colour, olivaceous to brownish.[49]

Distinctions: The Atlantic spiny lumpsucker may be recognized by its stout body, covered with prickly tubercles and by the sucker formed from the pelvic fins. It differs from the common lumpfish in being round in cross-section, rather than triangular, and in having both dorsal fins remaining distinct; the gill opening is shorter than in the lumpfish; the tubercles are larger and more numerous.

Size: Up to a length of 5 inches.[220]

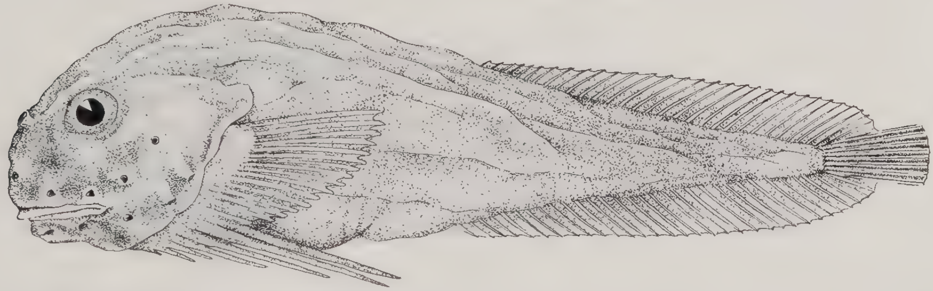
Range: An arctic species that occurs in the Canadian arctic and on the Labrador coast and strays south to the Gulf of Maine. Also known from Greenland, Iceland, Jan Mayen, and Spitzbergen.[220]

Canadian distribution: Mould Bay, Prince Patrick Island, N.W.T.;[517] Grinnel Land and Jones Sound;[220] Hudson Bay;[406] Lake Harbour, Baffin Island;[122] Ungava Bay;[124, 240] coast of Labrador in up to 45 fathoms from St. Lewis Inlet (52°20′N) to Seven Islands Bay (59°30′N);[19, 25, 172] Strait of Belle Isle; northern and eastern portions of the Grand Bank;[17, 18] Fortune Bay, Nfld.;[17] Trois Pistoles region, Que.;[514] Cheticamp, N.S.[95] Off Halifax Harbour, N.S.[232] Reported at least twice just across the Canadian border at Eastport, Maine.[205]

Longfin seasnail — Limace à longues nageoires

Careproctus longipinnis Burke 1912

DESCRIPTION: Body moderately elongate, gelatinous and semitransparent, covered with thin, lax skin; greatest depth at gill opening and about 3½ in total length, body tapering rapidly to a point at tail. Head 4–4½ in total length, blunt, upper profile high and rounded, slightly compressed, lower jaw slightly shorter; mouth terminal, low on head, angle under beginning of pupil of eye, small, simple teeth in jaws. Eye moderately large, 4 in head. Fins: dorsal (1) 51–55,[25] middle rays longest, about 2½ in head, fin begins slightly behind gill opening and is continuous with caudal; caudal small, narrow, not sharply separated from dorsal and anal; anal 44–50,[25] similar in height to dorsal, beginning under tip of pectoral fin, continuous with caudal; pectorals large, divided into a larger upper lobe that is rounded, and a smaller lower lobe that is pointed, its longest rays slightly exceed head length, base of fin runs along edge of gill cover, its anterior end under middle of eye; pelvics reduced, forming part of disc on ventral midline, disc small, cupped and triangular. Vent a short distance behind disc. Gill opening above base of pectoral. Skin naked except for dermal prickles in some larger specimens.[25] No lateral line.



Colour, gray.

DISTINCTIONS: The possession of single nostrils separates this genus from other seasnails belonging to the genus *Liparis* which have double nostrils. *Careproctus* has more anal fin rays than pectoral fin rays; this condition is reversed in *Liparis*. The longfin seasnail differs from other species of its own genus by having a deeper body, a longer lower lobe of the pectorals, and a more deeply cupped disc.[70a]

SIZE: Up to a length of 10½ inches.[454]

RANGE: This fish occurs in relatively shallow water on both sides of the North Atlantic Ocean and reaches the Arctic Ocean. It is found on the Labrador coast, in the Gulf of St. Lawrence, and off Nova Scotia. Also from the Faroe Islands to Beeren (Bear) Island.[70a]

Canadian distribution: A few specimens were collected in or near Goose Bay, Lake Melville, Labrador, in 1950–51, in depths up to 55 fathoms.[25] It has been taken frequently in the estuary of the St. Lawrence River—off Trois Pistoles, Baie Comeau, Rimouski and Fox River, P.Q.[285, 454, 514] Reported once on the outer coast of Nova Scotia, when a specimen was taken by a trawler in February 1937, northwest of Middle Ground at lat 44°47′N, long 60°55′W, from 82 fathoms.[313]

Biology and Economics: It eats amphipods and euphausiids.[25, 454] It probably spawns in late winter or early spring. Large eggs up to ⅙ inch in diameter have been found in females in September and February.[313, 454]

Sea tadpole **Limace de Reinhard**

Careproctus reinhardi (Krøyer) 1862

Description: Body somewhat elongate, subcylindrical anteriorly, greatest depth 4½–5 in total length, occurring about middle of pectoral fin, behind this point the body tapers rapidly to the tail. Head 4½ in total length, rounded, profile steep; mouth terminal, low on head, angle does not reach perpendicular through front of eye, a band of villiform teeth in each jaw. Eye moderate, 4⅓ in head. Fins: dorsal (1) about 54–55, middle rays longest being about 3½ in head, fin originates over middle of pectoral and is continuous to base of caudal with which it unites; caudal small, and truncate; anal 45–46, similar in height to dorsal, base shorter, fin begins under 8th dorsal ray and like the dorsal is united to base of caudal; pectorals large ⅔ length of head, rounded, notched, base low on side immediately behind gill opening; pelvics reduced to sucker, little larger than eye, located on ventral midline in front of base of pectorals. Lateral line present. Skin lax, viscid.

Colour, body semi-transparent, with rose to whitish tinges, vertical fins violet.

Distinctions: Very similar to *Careproctus longipinnis*, but the pelvic sucker is slightly larger than the eye, whereas that of *C. longipinnis* is smaller than the eye; it is less cup-shaped in the present species. *Careproctus ranulus* Goode and Bean is sometimes considered to be a distinct species, with a larger eye and a shallower pectoral notch; it has a more southern distribution. It is very similar to *C. reinhardi* and the validity of these species has been questioned.[70a] We are not differentiating *C. reinhardi* and *C. ranulus.*

Size: Up to 3 inches in length.[514]

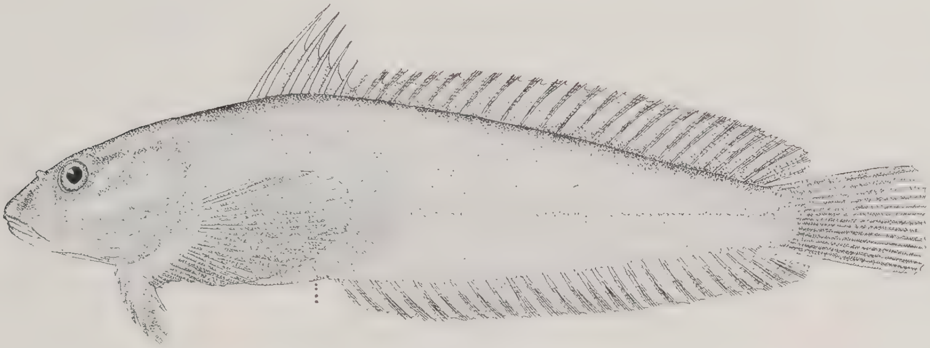
Range: An arctic deep-sea form descending to 700 fathoms. Known from the Gulf of St. Lawrence; from Greenland, Jan Mayen, and Bear Island, off Arendal, Norway, and in the Kara Sea. *Careproctus ranula*, as so described, is found from New England to Newfoundland.[70a]

Canadian distribution: Two specimens were recorded from near Trois Pistoles, Que., in the St. Lawrence estuary.[514] A specimen, identified as *C. ranulus*, was caught 8½ miles off Chebucto Head, Halifax Harbour, N.S., in September 1877.[170]

Atlantic seasnail **Limace atlantique**

Liparis atlanticus (Jordan and Evermann) 1898

Description: Body heavy anteriorly, moderately elongate, tadpole-shaped, soft, greatest depth 5½ in total length, greatest width 4 in total length, being near tip of pectoral fins; just behind this the body width narrows rapidly producing a tadpole-like tail which is much compressed. Head 5 in total length, blunt, depressed; mouth terminal, angle in front of eye, lower jaw slightly shorter, jaws with tricuspid teeth in wide bands. Eye small, 7 in head. Fins: dorsal (1) VI, 26–28, second spine longest, 1½ in head in males, shorter in females, subsequent spines decreasing in length, producing a notch but not a gap between spines and soft rays, latter fairly uniform and up to ⅘ length of longest spine, fin extends from middle of pectoral to base of caudal; caudal moderate, truncate; anal 23–27, located under soft portion of dorsal, its rays a trifle shorter than those of soft dorsal; pectorals large, rounded, fan-like, base extending along gill opening and under head where there is a secondary lobe with frilled edges; pelvics modified into a sucking disc on ventral midline between bases of pectorals. Lateral line along middle of side. Skin scaleless and smooth except that of the breeding male which has small prickles roughening it.



Colour, variable depending on habitat; usually olive to reddish-brown with darker dots; dorsal and anal fins frequently with cross-bars.

DISTINCTIONS: The seasnails are distinguished from other fishes by their tadpole-shaped, soft bodies, with smooth skin and a sucking disc on the ventral surface. The genus *Liparis* is characterized by having more pectoral than anal fin rays; in the genus *Careproctus* this is reversed and there are at least 48 anal rays. The seasnail differs from the striped seasnail and other species in having a notch, of greater or less prominence, between the spines and the soft rays of the dorsal fin. The sucking disc is larger than in other species; the Atlantic seasnail has less than 30 pectoral rays, the striped seasnail more than 30.

SIZE: Up to a length of about 5 inches.

RANGE: From Ungava Bay south to off New Jersey; most common between the Gulf of St. Lawrence, Grand Bank, and Cape Cod. A closely related species, *Liparis montagui*, occurs on the coast of northern Europe.

Canadian distribution: One specimen has been taken in southern Ungava Bay;[124] small specimens were trawled in 1952 in shallow water in Hebron Harbour and in Nutak Harbour, Labrador;[172] found in Sandwich Bay, Labrador;[17, 25] in Battle Harbour, Labrador;[25] off Blanc Sablon, Que.[17] Reported from Trois Pistoles, Que., region[514] and from the cold waters of the northern and southern Gulf of St. Lawrence;[204] frequent in the Miramichi estuary[312] and found at Red Cape, Magdalen Islands.[40] Reported around Newfoundland at Placentia Bay, Trepassey Bay, Conception Bay, off Notre Dame Bay, and, as young, pelagically on the northern, middle, and eastern parts of Grand Bank; taken pelagically on Banquereau.[17, 18, 19] Not uncommon on Atlantic coast of Nova Scotia;[513] trawled off Yarmouth, N.S.[19] Common in the Bay of Fundy and in Passamaquoddy Bay.[205, 313]

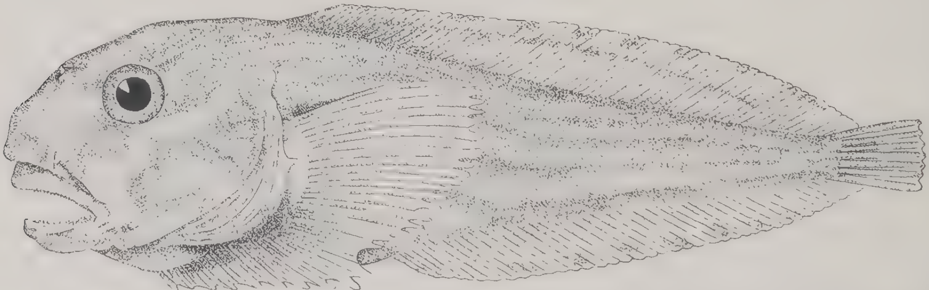
BIOLOGY AND ECONOMICS: The Atlantic seasnail is often found under stones or adhering by the sucker to seaweeds, but it is sometimes pelagic. It occurs at various depths from tide pools to 50 fathoms. Sometimes, like small hake, it is found inside scallop shells. It is frequently brought to the surface adhering to lobster traps or smelt nets.

Spawning occurs from late winter to spring. The eggs of a related European species are $\frac{1}{20}$ inch in diameter and adhere to bottom material in small clusters. It is presumed that the eggs of the North American species are similar.

Polka-dot seasnail — Limace marbrée

Liparis cyclostigma Gilbert 1895

DESCRIPTION: Body robust, much compressed posteriorly, greatest depth slightly over 4 in total length, occurring at origin of dorsal fin, body tapering evenly to base of tail. Head 4 in total length, broad, upper profile rather steep, snout rounded, anterior nostril in a prominent tube, mouth almost terminal, overhung slightly by snout, angle of mouth under front of eye, broad bands of small, tricuspid teeth in each jaw, inner ones largest. Gill slit rather long, extending in front of 12–14 pectoral rays. Eye 6 in head. Fins: dorsal (1) 40–44, middle and posterior rays longest, being $2\frac{1}{2}$ in head, fin begins a short distance behind a vertical though posterior edge of gill cover and extends to caudal with which last rays are united; caudal small, rounded, dorsal and anal fins united with it for about $\frac{1}{3}$ its length; anal 32–36,[172] similar in height and form to dorsal but shorter, origin under tip of pectoral; pectorals broad, 2-lobed, upper lobe rounded, longest rays $\frac{2}{3}$ length of head, base along gill slit and extending down and forward to form sucking disc; pelvics reduced to knobs in the disc; disc large, distance between it and origin of anal fin $1\frac{4}{5}$, or less in head. Lateral line indistinct. Skin thin, flabby.



Colour, of fresh specimens, a pale reddish-pink background with brassy-yellow overtones; chin and disc white; upper parts of head and sides vermiculated with greenish-brown; vertical fins with light and blackish bands; edges of pectorals dark.[172]

DISTINCTIONS: *Liparis cyclostigma* is distinguished from the Atlantic seasnail and striped seasnail by the larger number of dorsal fins rays, 40 or more as compared to less than 30. It has fewer dorsal rays than *L. koefoedi.* The gill opening is much wider than in *L. tunicatus*, extending past 12–14 pectoral rays, rather than 3–6 as in *L. tunicatus.*

SIZE: Up to a length of 14 inches.[70a]

RANGE: In cold arctic waters, reported from Bering Sea, Hudson Bay, and the Labrador coast.

Canadian distribution: Two specimens were reported from the lower middle part of Hudson Bay, and others believed to be this species were taken from the stomachs of cod caught in Ungava Bay.[496] Taken at many points on the Labrador Coast between Hebron Fjord (lat 58°09′N) and Pigeon Island (lat 53°54′N). Many large specimens in depths of 65–135 fathoms in Hebron Fjord; these were in very cold water.[25, 172]

Gelatinous seasnail — Limace gélatineuse

Liparis koefoedi Parr 1932

DESCRIPTION: Body robust, greatest depth 4⅕ in total length, occurring at origin of dorsal fin, body tapering evenly to base of tail where it is very slender. Head 4 in total length (3.7–4.2),[342] heavy, broad, upper profile rather steep, snout rounded, mouth almost terminal, angle under front of eye, teeth in about 13 oblique, widely spaced rows in each half of jaws, inner teeth larger and simple, outer ones small and trilobed.[70a] Eye about 6 in head. Fins: dorsal (1) 44–50,[25] middle and posterior rays longest being 1¾ in head, fin begins over middle of pectoral and continues along back uniting with front half of caudal; caudal small, rounded, dorsal and anal fins joined to its forward half; anal 37–41, similar in height and form to dorsal but beginning under posterior quarter of pectorals; pectorals large, 2-lobed, broad, longest rays about equal to head length, lower part of fins forming sucking disc; pelvics reduced to knobs in sucking disc. Lateral line not very distinct. Skin comparatively thin and loose, mature males bearing small tubercles or prickles in the upper head region and along the dorsal fin; a few prickles along rear part of anal fin; females lack prickles. Superficial portions of body extremely gelatinous and transparent in specimens from most localities; firm and opaque from others.

Colour, variable with brown or black pigment spots on the surface or deep down. Peritoneum black and usually showing through the body and skin.[25, 342]

DISTINCTIONS: The gelatinous seasnail is distinguished from all the other liparids of this region by the possession of 45–50 (44 rarely) dorsal fin rays; other species of *Liparis* have less than 45 and *Careproctus* has more than 50. The black peritoneum is a useful character.

SIZE: It is reported to attain a maximum length of 5¾ inches.[342]

RANGE: Probably circumpolar.[70a] Reported doubtfully from Alaska;[518] from Ellesmere Island, Ungava Bay, Labrador, Greenland, Spitzbergen, Kara, and Barents seas.[342]

Canadian distribution: Reported from Alert, Ellesmere Is.;[517] in Jones Sound;[212] Lake Harbour, Baffin Is.;[122] Ungava Bay.[124] On the Labrador coast at Hebron;[23, 122] at Kangalaksiorvik;[23] at various points in Hamilton Inlet in 25–55 fathoms.[23, 25] Three small specimens taken in the northeastern Gulf of St. Lawrence in 1915 were referred to this species, but doubt was expressed about the identification.[102]

Striped seasnail **Limace barrée**

Liparis liparis (Linnaeus) 1766

Description: Body heavy anteriorly, moderately elongate, tadpole-shaped, soft, greatest depth 4¾ in total length, greatest breadth 4 in total length at base of pectoral fins, tapering rapidly from middle of pectorals, posterior portion of body compressed. Head 4¾ in total length, blunt, depressed; mouth terminal, oblique, angle in front of eye, small tricuspid teeth in rows in jaws. Eye small, 7 in head. Fins: dorsal (1) 33–35, rays gradually increasing in length to ½ of head length, fin originates above posterior third of pectoral and ends at base of caudal to which it is united by a membrane, base length over half total body length; caudal moderate, truncate; anal 26–29, rays a little shorter than those of dorsal, origin under 8th dorsal ray, ending at base of caudal to which it is united; pectorals large, rounded, with a frilled anterior lobe, some rays of which are produced, bases of these lobes joined across the isthmus, posterior edge of fin almost reaching origin of anal; pelvics reduced to a sucking disc on the ventral median line between the pectorals but behind the frilled lobe of these fins, diameter of sucking disc 1½ in head. Skin smooth, scaleless, loosely attached.

Colour, olive to light-brown, sometimes with yellowish or whitish patches; often marked with longitudinal stripes; fins darkly blotched or barred; very variable.

Distinctions: The striped seasnail may be distinguished from the Atlantic seasnail by its lack of long spiny rays at the anterior end of the dorsal fin and the lack of a notch dividing the first 6 rays from the others; the pectoral has 32 or 33 rays as compared with 30 or less in the Atlantic seasnail.

Size: Up to a length of 10 inches in arctic seas; not over 5 inches long elsewhere.[49]

Range: Both sides of the North Atlantic Ocean and in the Arctic Ocean, ranging from Alaska and the Northwest Territories south to off Virginia; at Greenland, Spitzbergen, White Sea, north of Siberia, and south to northern France.

Canadian distribution: Bernard Harbour, N.W.T.; off Stapylton Bay, Dolphin and Union Strait; Alert, Ellesmere Island.[517, 518] Strait of Belle Isle and north on the Labrador coast.[17, 19] Trois Pistoles region, Que.;[514] Anticosti Island,[405] Conception Bay, off Bay Bulls and Placentia Bay, Nfld.[17, 19] Common on the Nova Scotia coast.[232] Not uncommon in the Bay of Fundy and Passamaquoddy Bay; reported from Grand Manan and Eastport, Maine.[205]

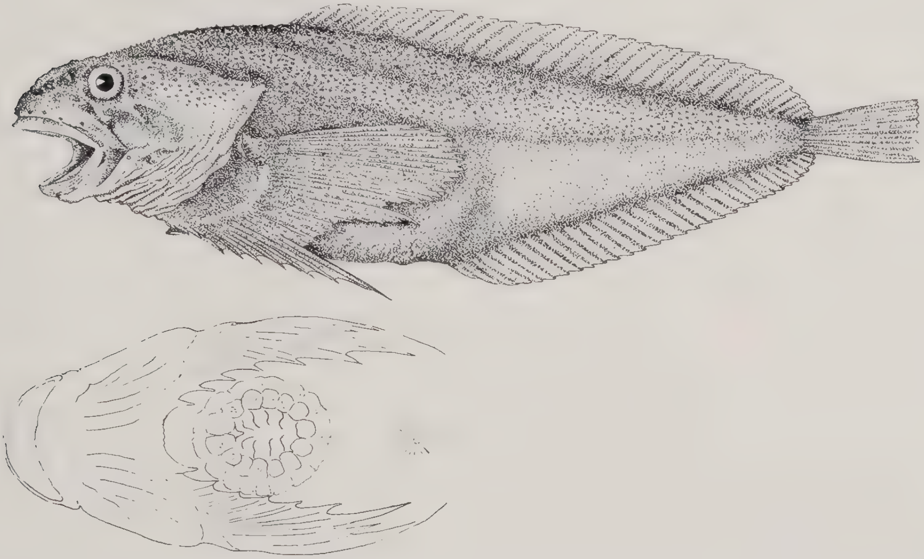
Biology and Economics: The striped seasnail lives along shore and down to depths of 100 fathoms. It often clings to seaweed and stones. Small ones are often found inside scallop shells.

It spawns in winter and spring. The eggs are about $\frac{1}{16}$ inch in diameter and adhere in clumps to seaweed and other bottom materials.

Greenland seasnail **Limace du Groenland**

Liparis tunicatus Reinhardt 1836

Description: Body robust, greatest depth about 4½ in total length, occurring in front of dorsal fin, tapering to tail. Head 4 in total length, heavy and broad, slightly depressed above eyes; mouth nearly terminal, broad, angle reaches vertical from pupil of eye; teeth short, stout, arranged in about 11 oblique rows in the half of each jaw, trilobed, lateral lobes almost as prominent as central one.[70a] Eye small, 5⅓–6⅓ in head. Fins: dorsal (1) 41–44, without notch, fin begins over end of first third of pectoral, last rays connected to basal ¼ of caudal; caudal slightly rounded, connected for about ¼ its length to dorsal and anal fins; anal 34–37, extending to caudal; pectoral fin notched, lower lobe of 7 rays reaching halfway between disc and vent or beyond, located immediately behind gill slit, extending under throat and forming sucking disc, which is large with a broad flap; pelvics reduced to knobs in centre of sucking disc. Skin without prickles.[70a]



Colour, of upper parts of head and body gray to brownish, sometimes with pale stripes from snout, along top of head to dorsal fin and then along sides to base of caudal; other specimens lack these stripes and have brown dots scattered over the skin. Outer half of dorsal and anal fins darker than base.[70a]

DISTINCTIONS: *Liparis tunicatus* is distinguished from the seasnail (*L. atlanticus*) and the striped seasnail (*L. liparis*) by the number of rays in the anal fin which exceed 30, whereas the last two species have less than 30. It has fewer dorsal rays than *L. koefoedi. Liparis tunicatus* has the gill opening restricted to the width of 3–6 pectoral rays, while in *L. cyclostigma* the gill opening extends past more than 10 pectoral rays.

SIZE: Up to slightly over 7 inches in length.

RANGE: Arctic waters about Greenland and Labrador; one doubtful record from Massachusetts.[70a] Also found in the estuary of the St. Lawrence River.

Canadian distribution: Numerous specimens were taken from tidepools and from cod stomachs in Ungava Bay.[121] Reported from the Labrador coast at Komaktorvik Fjord (59°20′N); from

Saglek Bay (58°30′N); from Kaipokok Fjord (54°52′N); and from Indian Harbour, Hamilton Inlet.[25, 172, 241] Taken frequently near Trois Pistoles, P.Q., in the estuary of the St. Lawrence.[514]

Family DACTYLOPTERIDAE Flying gurnards

This is a small family of modified spiny-rayed fishes of tropical seas. It is a close relative of the searobin and sculpin but differs from them by reason of the greatly elongated pectoral fin which extends beyond the posterior edge of the anal fin; also by the backward extension of the gill cover in the form of a spine which lies close to the body between the bases of the pectoral and pelvic fins. The latter fins are thoracic in position.

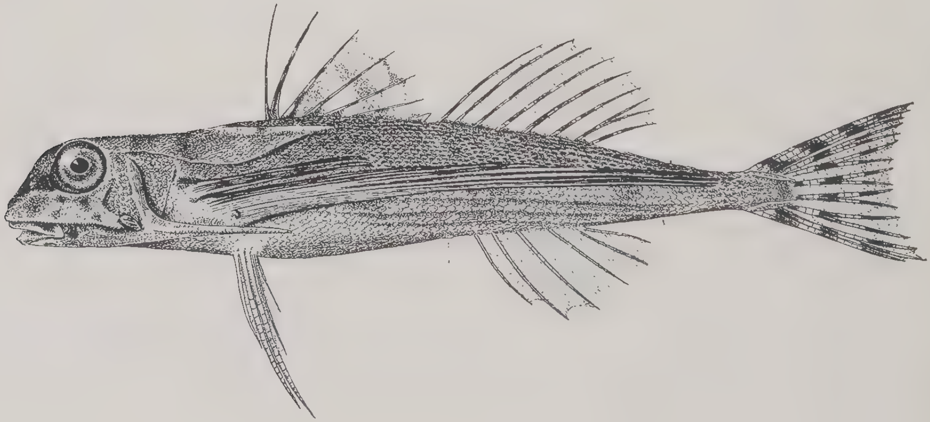
One species has been reported to occur in our area.

Flying gurnard Dactyloptère

Dactylopterus volitans (Linnaeus) 1758

OTHER COMMON NAMES: sea swallow

DESCRIPTION: Body elongate, greatest depth about 6½ in total length occurring under 3rd spine of first dorsal, subquadrangular; caudal peduncle moderate, 2 serrated knife-like ridges at base of caudal. Head very blunt, about 5½ in total length, front profile very steep, front and top of head covered with bony armour, which extends backward above the base of the pectoral fin and ends in a spine under the middle of the first dorsal fin; the preopercular bone extends backward as a stout, rough spine below the pectoral fin and a short distance beyond its base; mouth terminal-inferior, lower jaw included, angle under front edge of eye, small granular teeth on jaws only. Eye large, about 3 in head, high on side of head. Fins: dorsals (2) 1st VI–VII, first 2 spines free from membrane that joins remainder, first 4 spines about equal, 1½ in head, base a trifle less than head length, fin originates about its own length behind eye, 2nd dorsal 8, separated from 1st dorsal by a very short space, middle rays



longest, 1¼ in head, base of fin equalling length of 1st dorsal; caudal moderate, lunate; anal 6, under but a trifle shorter than second dorsal, 2nd and 3rd rays longest 1½ in head; pectorals divided into upper and lower sections, upper part reaches just beyond middle of 1st dorsal, lower section scythe-shaped reaching almost to base of caudal, base of fin oblique and behind gill opening; pelvics much smaller, middle rays a little longer than head, located ventrally under bases of pectorals. Body covered with small, strongly-keeled scales.

Colour, variable; usually brilliant shades of brownish to greenish-olive above, under sides paler, irregularly blotched with reddish or salmon-yellow tints; pectorals marked with bright blue streaks near base, and blue spots and bars near tips; caudal fin with three brownish-red cross-bars.[49]

DISTINCTIONS: The flying gurnard resembles the searobins but has a more slender body. It can be distinguished by its extremely long pectoral fins and the absence of pectoral "feelers." Its two dorsal fins separate it from the flying-fishes which have only one dorsal fin.

SIZE: Up to a length of 12 inches.

RANGE: Tropical and warm temperate seas on both sides of the Atlantic Ocean. Common between North Carolina and Brazil, straying north of Cape Cod occasionally.

Canadian distribution: Although this species has been reported on the Canadian coast two or three times the records are all open to doubt. The earliest record vaguely mentions it for New Brunswick and Maine.[2, 93] In September 1939 a small dried-up specimen slightly over 2 inches long was picked up on shore at Sonora, near Liscomb, N.S. The finder, Stanley McKinley, suspected that it might have been washed off the deck of a passing steamer, but stated that he had seen an 8-inch specimen in the same locality in 1932.[306]

BIOLOGY AND ECONOMICS: The flying gurnard is said to leap from the water and glide through the air, using the long pectoral fins as planes.

Order HETEROSOMATA (Pleuronectiformes) — FLATFISHES

The flatfishes are closely related to the percomorph fishes but are strongly compressed, have both eyes on one side and long, well-developed, soft-rayed dorsal and anal fins.

This is one of the most clearly defined and distinct orders of fishes owing to its asymmetry. The fishes commence life swimming about in a normal manner, but early on strange changes take place in their behaviour pattern and instead of swimming upright, they commence to lie and swim on one side. The eye on the blind (or lower) side moves over to the uppermost side, a change that involves complex modification of the skeletal structure of the head and also of the nervous and muscle tissue. A further interesting modification is that the eyes can be raised slightly and moved independently, thus increasing the creature's field of vision.

The uppermost side is also the pigmented side, while the lower side is usually white. Occasionally the blind side will exhibit partial pigmentation or, if complete on the body, the region about the eye may be white and lacking in pigment.

Most species characteristically come to lie on either the left or the right side. Flatfishes are said to be sinistral or dextral, depending on which side is the upper side or eyed side. The most common family in our area, the Pleuronectidae, are dextral flounders—that is, these fishes lie on their left side and the right side is the eyed, pigmented and uppermost side. Reversal does occur on occasion, and a species normally dextral may be sinistral. In a few species, particularly on the Pacific coast, the pattern appears to be not too rigidly determined, and dextral and sinistral forms of the same species occur with almost equal frequency.

The flatfishes are carnivorous, feeding on a variety of animal tissues. Essentially bottom-living fishes of continental shore waters, the flatfishes are widely distributed in tropical and temperate seas with a few species penetrating arctic waters.

The approximately 500 species are classified in six families; ten species in two families (sinistral Bothidae and dextral Pleuronectidae) occur in our area, including such forms as the Atlantic halibut, winter flounder, and American plaice, and many of these species make significant contributions to the commercial fishery.

KEY to Order HETEROSOMATA—Flatfishes

1 Eyes and pigment on right side 2
Eyes and pigment on left side 8

2 Mouth large, maxillary extending to below middle of eye or beyond; teeth well developed 3
Mouth small, maxillary extending at most to front of eye 5

3 Caudal fin distinctly rounded; lateral line almost straight but curving slightly over pectoral fins; dorsal fin rays 75–96; body reddish-brown .... American plaice, *Hippoglossoides platessoides* (p. 389)
Caudal fin slightly forked, not rounded, corners of caudal fin angular; dorsal fin rays 98–105; body colour gray-brown or dark brown to olive 4

4 Lateral line arched above pectoral fin; dorsal fin rays 98–105; body colour dark and blotchy above, distinctly white below .... Atlantic halibut, *Hippoglossus hippoglossus* (p. 392)
Lateral line straight, even slightly decurved above pectoral fin; dorsal fin rays about 100; body colour grayish-brown; creamy below but not white .... Greenland halibut, *Reinhardtius hippoglossoides* (p. 401)

5 Lateral line distinctly arched over pectoral fin; anal fin preceded by a short spine directed forward; body usually spotted .... Yellowtail flounder, *Limanda ferruginea* (p. 395)
Lateral line more or less straight 6

6 Lower blind side of head with circular depressions (sometimes called "pits"); right pectoral fin with conspicuous black pigment toward tip visible on fish 5 inches long and over; dorsal fin rays more than 100 .... Witch flounder, *Glyptocephalus cynoglossus* (p. 388)

No depressions on lower or blind side of head; pectoral fin without black pigment; dorsal fin rays less than 75 7

7 Region between eyes without scales (smooth to the touch); dorsal fin rays 55–58; body colour uniformly brown to almost black .... Smooth flounder, *Liopsetta putnami* (p. 397)

Region between eyes with scales (rough to the touch); dorsal fin rays 65–75; body colour usually dark-brown to black with spots or blotches .... Winter flounder, *Pseudopleuronectes americanus* (p. 398)

8 Body very deep (and thin), being almost round in outline; anterior 10 rays of dorsal fin free of membrane, long branched and fringe-like; left pelvic fin very broad at base, appearing almost as part of anal fin .... Windowpane, *Scophthalmus aquosus* (p. 386)

Body longer than deep; anterior dorsal fin rays not fringe-like; pelvic fins distinct and with narrow bases (*Paralichthys*) 9

9 Eyes small, interorbital distance about equal to diameter of pupil; number of gill rakers on outer arch 16–24; pigmented side with a number of black spots of different sizes .... Summer flounder, *Paralichthys dentatus* (p. 383)

Eyes large, interorbital distance much less than the diameter of pupil; number of gill rakers on outer arch 9–13; pigmented side with four prominent black spots only .... Fourspot flounder, *Paralichthys oblongus* (p. 385)

Family BOTHIDAE — Lefteye flounders

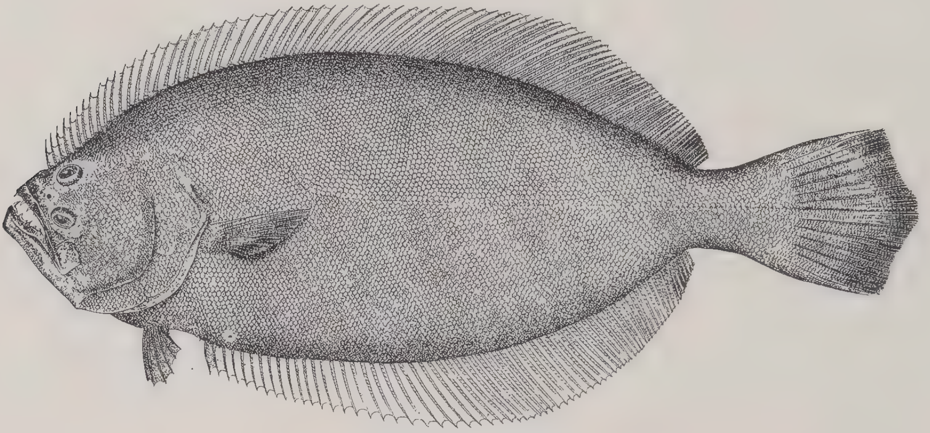
Summer flounder — **Cardeau d'été**

Paralichthys dentatus (Linnaeus) 1766

OTHER COMMON NAMES: flounder, fluke

DESCRIPTION: Body oblong, compressed, lying on right side; greatest width 2⅘ in total length, a short distance behind tip of pectoral fin. Head 4 in total length, upper profile convex, lower jaw projecting slightly beyond upper; mouth large, oblique, its angle below posterior part of pupi, a single row of slender, sharp teeth in jaw, largest at front of mouth; no teeth on vomer or palatines. Eyes 6 in head, closely placed. Fins: dorsal (1), 85–94, beginning just in front of right eye and extending to caudal peduncle, longest rays ⅓ length of head; caudal rounded anal 60–73, beginning behind vent and below posterior tip of gill cover, ending on caudal peduncle under end of dorsal, longest rays about middle of fin and a trifle longer than longest dorsal rays, no preanal spine; pectorals inserted on sides behind and below extreme tip of operculum, slightly less than ½ length of head; pelvics on ventral edge well in front of pectorals

⅔ length of pectorals. Lateral line arched above pectoral fins. Scales small, covering body and much of head.



Colour, variable depending on background with shades of brown or gray above but sometimes blue or green to almost black. Usually with 10–14 ocellated dark spots scattered on upper surface—some near the base of the dorsal and others near base of anal fin; these spots sometimes inconspicuous. Blind side whitish.

DISTINCTIONS: The summer flounder is distinguished from most flatfishes by the combination of eyes on the left side, large mouth, and rounded tail. It shares these characters with the fourspot flounder and the windowpane. It differs from the fourspot in having more dorsal and anal fin rays and in having more than four ocellated spots. It differs from the windowpane in having normally shaped pelvic fins with narrow bases (the windowpane has short-rayed, long-based pelvics) and in having simple rays in the forward part of the dorsal fin as compared with branched rays in the windowpane.

SIZE: Up to 37 inches in length and a weight of about 26 pounds.[49]

RANGE: Maine to South Carolina, rare north of Cape Cod; straying north to LaHave Bank off Nova Scotia.

Canadian distribution: Only recorded twice in this area. One was reported slightly to the east of LaHave Bank at lat 43°03′N, long 63°29′W, in 85 fathoms by the *Challenger* expedition.[513] A specimen 20 inches long and weighing 4 pounds was caught in Passamaquoddy Bay in December 1955.

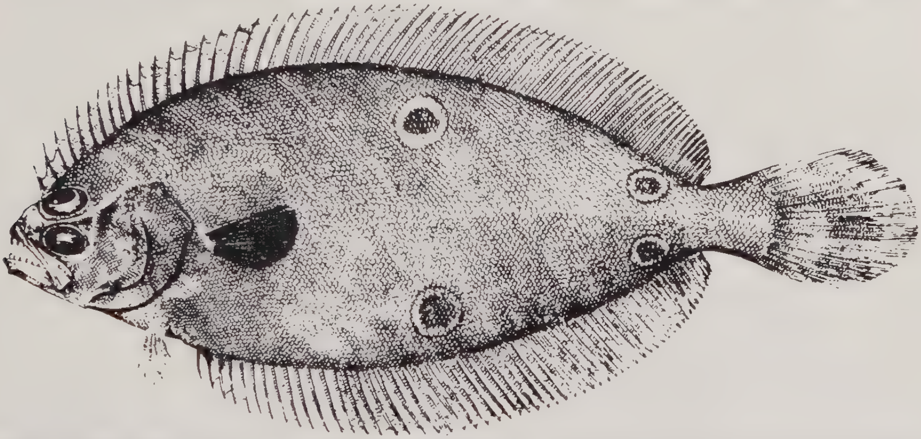
BIOLOGY AND ECONOMICS: While usually caught at moderate depths (10–80 fathoms) offshore, the summer flounder comes into shallower water on sandy or muddy bottom in summer. They spawn in early spring at the northern end of their range. They eat small fishes, squid, crabs, shrimp, marine worms, and sand dollars.[49]

Obviously this species is of no importance in Canada, but the species is fished commercially from Nantucket Shoals southward.

Fourspot flounder **Cardeau à quatre ocelles**

Paralichthys oblongus (Mitchill) 1815

Description: Body oblong, much compressed; eyes on left side, greatest depth 3 in total length; caudal peduncle moderate. Head 4½ in total length, upper profile convex; mouth terminal, large, angle under middle of eye, lower jaw projecting, upper jaw with numerous small, close-set teeth and 4 or 5 canines near front of jaw, lower jaw with 7 or 8 teeth on each side, largest in front. Eyes 4½ in head, close together, but separated by a sharp ridge. Fins: dorsal (1), 72–81, beginning over front of right eye and ending on caudal peduncle, membrane only partial between first rays, longest rays about 3 in head; caudal moderate, rounded; anal 60–67, beginning under tip of gill cover and ending on caudal peduncle under end of dorsal; pectorals small, rounded, base behind and slightly below tip of gill cover, length a little more than 2 in head; pelvics smaller, on ventral edge, in front of pectorals. Lateral line arched over pectoral fin. Small scales covering body and much of head.



Colour, of back mottled-gray, under side light-gray, but sometimes darker; somewhat translucent. Four (sometimes six) large, oblong, conspicuous spots on posterior half of upper side, one pair near caudal peduncle, the other just behind middle of body; these spots black with pale edging.

Distinctions: This flounder is best distinguished by the four spots on the back. It is like the summer flounder in having eyes on the left side, large mouth, and arched lateral line. It has fewer dorsal and anal fin rays than the summer flounder as well as the colour differences.

Size: The fourspot flounder reaches a maximum length of 16 inches.

Range: From the eastern part of Georges Bank to the coast of South Carolina; rare in the Bay of Fundy.

Canadian distribution: Ginsburg[162] reported on a specimen, registered in the United States National Museum (No. 23905), said to have been taken off Nova Scotia, lat 45°25′N, long

57°10′W, in 170 fathoms. The specimen in question was entered in the register in 1880 as *Pseudorhombus oblongus* but Ginsburg was unable to locate the specimen to verify the identification. The species was reliably reported from Canadian waters in 1958 when two were examined from the lower Bay of Fundy. The first specimen was caught in Passamaquoddy Bay on June 7, 1958. It was 14½ inches long. The second specimen was landed at Fundy Fisheries Limited, Beaver Harbour, New Brunswick, in June or July 1958, and was caught in the lower Bay of Fundy. Both specimens are preserved at the Biological Station, St. Andrews, N.B.

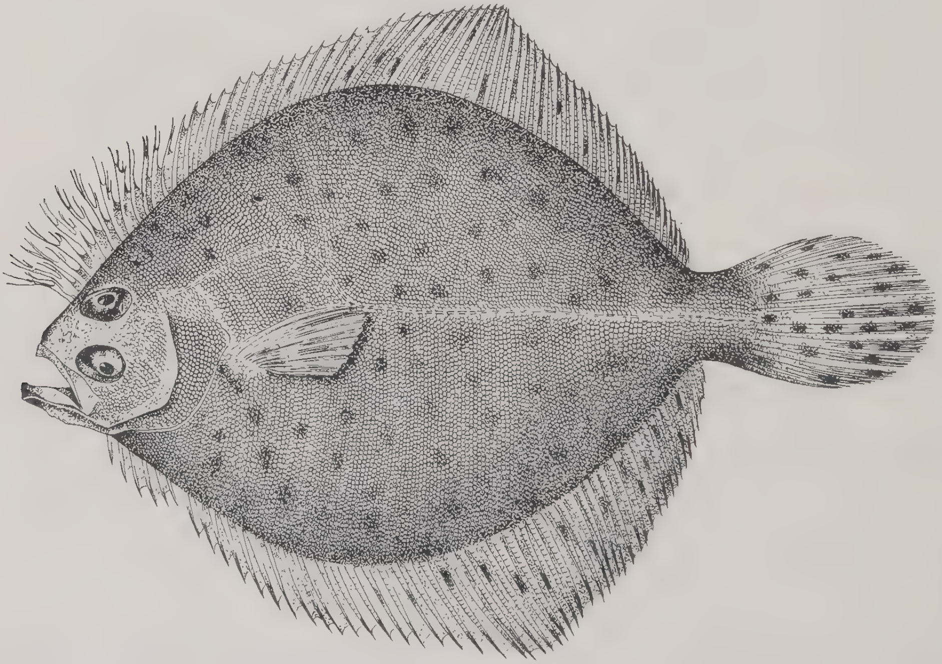
BIOLOGY AND ECONOMICS: The fourspot flounder is usually captured off shore in 7–150 fathoms of water. It eats small fishes, squid, crabs, shrimp, and shellfish. Spawning takes place in late spring and early summer. The eggs are spherical, buoyant, and about $\frac{1}{25}$ inch in diameter.

Windowpane **Turbot de sable**

Scophthalmus aquosus (Mitchill) 1815

OTHER COMMON NAMES: brill, spotted flounder, sand dab, sand flounder, "turbot"

DESCRIPTION: Body broadly ovate, lying on right side, much compressed, translucent while alive; greatest width scarcely 2 in total length, at tip of pectoral fins. Head 4½ in total length; mouth large, oblique, its angle under front edge of pupil, one row of teeth in each jaw. Eyes 4 in head, moderately spaced. Fins: dorsal (1), 63–73, first 12–15 rays free and branched at their tips, beginning slightly in front of right eye and ending on base of caudal peduncle, rays of first ⅔ of fin about equal, then their length decreasing; caudal rounded; anal 46–54, originating directly under preopercle and terminating on caudal peduncle, under end of dorsal, longest rays about equal to those of dorsal; pectorals large, ⅔ length of head,



inserted on sides behind gill opening, fin on blind side smaller; pelvics dissimilar, left one on lower edge of body, beginning under left eye, longer than high, only a slight break between it and anal, right fin smaller, situated a short distance up the right side. Lateral line arched above pectoral. Scales smooth, covering body and posterior part of head.

Colour, reddish to grayish-brown with many brown spots each made up of several sections like flower petals; dark mottling on dorsal, anal, and caudal fins; right side usually white, occasionally with some dark blotches.

DISTINCTIONS: The large mouth and eyes on the left side distinguish this flatfish from all others of this area except the summer flounder. The windowpane is readily distinguished by the shape of the left pelvic fin which is longer than high, by the fringed "crest" at the beginning of the dorsal fin, and by the almost circular body shape.

SIZE: Specimens 17 inches long were found at the head of the Bay of Fundy and a maximum length of 18 inches has been recorded elsewhere.

RANGE: Coastal waters of eastern North America, including some banks, from the Gulf of St. Lawrence to South Carolina.

Canadian distribution: The most northerly record is from Port-au-Port Bay on the west coast of Newfoundland.[18, 152, 427] Elsewhere in the Gulf of St. Lawrence it is reported as common at the Magdalen Islands;[93] moderately common in the Miramichi estuary;[312] small specimens at Malpeque Bay, P.E.I.[334] Found at Canso, N.S., and Chedabucto Bay;[91] on Sable Island Bank.[17, 513] Uncommon in the lower Bay of Fundy and St. Mary Bay but common at the head of the Bay of Fundy in Minas Channel and Basin.[205]

BIOLOGY AND ECONOMICS: The windowpane lives in shallow water on sandy bottom; it has been reported occasionally on Georges Bank in 40 fathoms.[49] There is no evidence of much migration although tagging in Long Island Sound showed some coastwise movement; in one case a fish was recaptured 80 miles from the tagging point.[327] Adults tolerate a wide range of temperature but the distribution suggests that reproduction is not successful unless the water is warm in summer.

The windowpane spawns in late spring and early summer in the northern part of its range. The eggs are spherical, $\frac{1}{20} - \frac{1}{25}$ inch in diameter, with a small oil globule. They float in sea water. They have been hatched at temperatures from 50–70 F. Incubation requires 8 days at 51–56 F.[49] Larvae have been found in Minas Basin and on Sable Island Bank in the Canadian region.

The growth of the windowpane has not been studied except for Long Island Sound; there, 2-year-old sand flounders averaged 4½ inches in length, 4-year-olds, 9½ inches, and 7-year-olds, 12 inches.[327]

In Minas Basin small windowpane fed on mysids almost exclusively but fish over 11 inches long ate sand shrimp and small fishes up to 4 inches in length, in about equal amounts. The fish were tomcod, smelt, hake, pollock, striped bass, and herring.[64] In Long Island Sound mysids, sand shrimp, amphipods, and occasional sand lance were the important food.[327] At Woods Hole fish were an important constituent of their diet.

The windowpane has not been utilized in Canada and supplies are limited. In wartime some were marketed in the United States. The thin body makes filleting difficult.

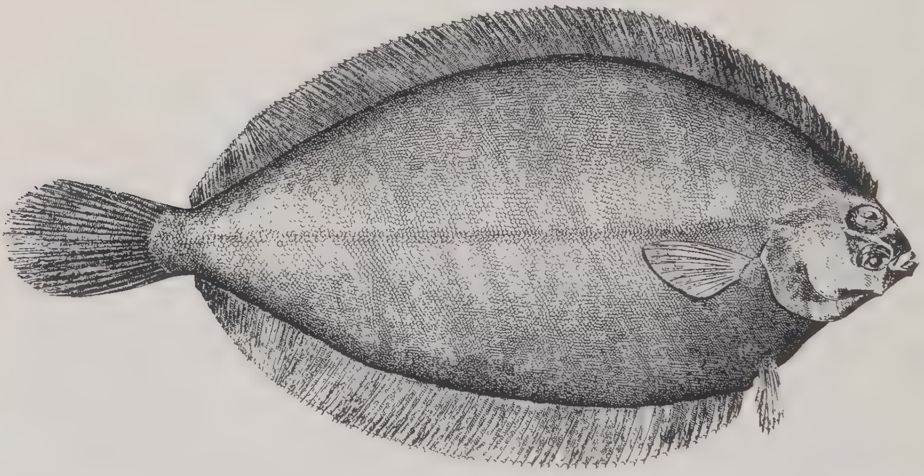
Family PLEURONECTIDAE — Flounders and halibuts

Witch flounder **Plie grise**

Glyptocephalus cynoglossus (Linnaeus) 1758

OTHER COMMON NAMES: gray sole, Craig fluke, pole flounder, flet

DESCRIPTION: Body elongate-oblong, lying on left side, much compressed, greatest depth 2¾ in total length, a short distance behind the tip of pectoral; caudal peduncle moderate. Head relatively small, about 6 in total length; mouth very small, its angle well in front of eyes; a single series of incisor-like teeth in each jaw; blind side of head deeply sculptured with about 12 mucous pits. Eye 4 in head. Fins: dorsal (1), 100–115, beginning over middle of left eye and extending to base of caudal peduncle, most of the rays about ⅓ head length, gradually shortening at both ends of fin; caudal rounded, relatively small; anal 87–100, preceded by a short, sharp, preanal spine, beginning under base of pectoral and ending on caudal peduncle under end of dorsal, rays slightly longer than those of dorsal; pectorals inserted on sides behind gill opening, ⅔ length of head; pelvics inserted on ventral edge, slightly in front of base of pectorals, smaller than pectorals. Lateral line almost straight. Scales small, covering body and most of head, smooth.



Colour, grayish-brown, sometimes with darker transverse bars; dorsal and anal fins sometimes spotted and tinged with violet; membrane of pectoral fin on eyed side dusky to black; blind side grayish-white, with minute dark points scattered throughout.

DISTINCTIONS: The small mouth, straight lateral line, and eyes on the right side distinguish the witch from all flatfishes except the winter and smooth flounder. It is most easily recognized by the mucous pits on the blind side of the head. Its small head and large number of dorsal and anal fin rays serve as further distinguishing points. Its body is thinner than that of any other small-mouthed flatfish.

SIZE: Up to 25 inches in length.

RANGE: On both sides of the North Atlantic Ocean in moderately deep water. Adults occur in the Gulf of St. Lawrence and on the southern Grand Bank, thence south to off Cape Hatteras. Floating larvae are found as far north as the Strait of Belle Isle. Occurs at Iceland and in Europe from northern Norway to the west coast of France.

Canadian distribution: The pelagic larvae of the witch have been found in the Strait of Belle Isle and along the east and west coasts of Newfoundland, although the adults have not been caught there.[150] Adults are caught on southern Grand Bank, St. Pierre Bank, St. George Bay, and off Port-au-Port Bay on the west coast of Newfoundland.[17, 18, 19] Reported in the Gulf of St. Lawrence from the Trois Pistoles, Que., region;[357, 514] Chaleur Bay, Orphan Bank, numerous along the Cape Breton coast from Cheticamp, N.S. to Cape North off Sydney Bight;[95] a few are taken in the outer Miramichi estuary.[312] Trawled in Chedabucto Bay.[91] Caught in considerable quantities on Banquereau, Canso Bank, Middle Ground, and Western Bank and in lesser quantities on Sable Island, Emerald, Roseway, and LaHave banks.[310] Generally distributed but not abundant in the deeper parts of the Bay of Fundy and St. Mary Bay.[205]

BIOLOGY AND ECONOMICS: The witch flounder lives chiefly in depths of 25–150 fathoms but has been found between 10 and 858 fathoms. It prefers mud or mud-sand bottom and occurs in water where the temperature varies from 30 to 50 F.

Spawning takes place in late spring to summer. The eggs are spherical, $\frac{1}{25}-\frac{1}{20}$ inch in diameter and they float throughout their incubation period. Hatching occurs in 7–8 days at temperatures of 46–49 F. Larval life is long and the little fish reach a length of 1½ inches before the left eye moves to the right side of the head. Judging by European studies, subsequent growth of the witch flounder is slow.

Food of the witch flounder includes small shrimp (particularly amphipods), marine worms, and small molluscs.

Despite its thin body, the witch flounder, because of its fine flavour, has become increasingly important commercially, and is taken extensively by the Danish seine as well as otter trawl.

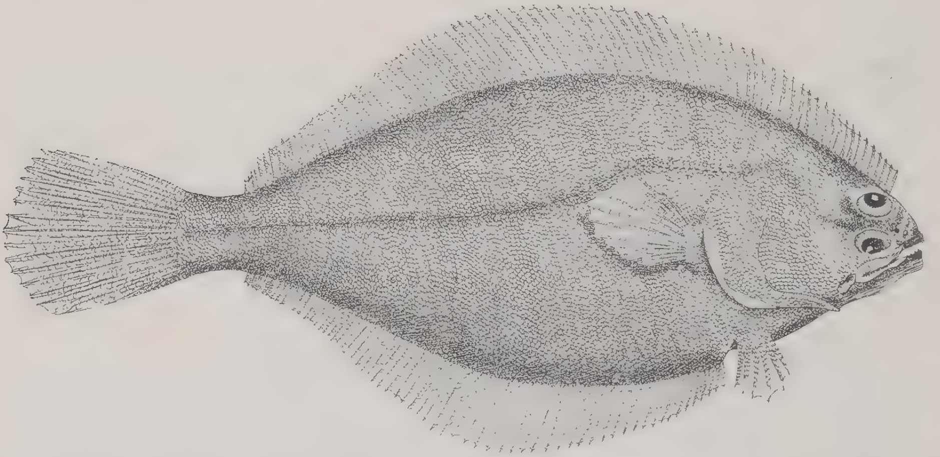
United States fishermen take substantial catches of witch flounder from grounds off the Canadian coast. In 1955 the total catch of witch flounder off the east coast of North America was approximately 26 million pounds.

American plaice **Plie canadienne**

Hippoglossoides platessoides (Fabricius) 1780

OTHER COMMON NAMES: Canadian plaice, plaice, dab, sand dab, blackback, flounder, sole, plie

DESCRIPTION: Body oblong, compressed, lying on left side (rarely reversed); greatest width 2⅘ in total length, at tip of pectoral fins; caudal peduncle moderate. Head 4½ in total length; mouth large, front angle of lower jaw projecting slightly, angle of mouth under middle of pupil; one row of small, conical teeth in each jaw; no teeth on vomer or palatines. Eyes 6 in head, a low interorbital ridge between them. Fins: dorsal (1), 76–96, originating just in front of left eye and terminating on caudal peduncle, longest rays about ⅓ length of head and about middle of fin; caudal well rounded; anal 64–77, beginning just behind vent and under posterior part of gill opening, ending under posterior end of dorsal, longest rays slightly exceeding those of dorsal, a prominent preanal bony spine; pectorals on mid-side behind gill opening, rounded, fin on eyed side slightly the larger and equal to ⅖ length of head; pelvics 6-rayed, on ventral edge, in front of pectorals, the 2 fins equal, smaller than pectorals. Lateral line straight, except for a very slight arch above pectoral. Head and body covered with small scales, those on eyed side with tooth-like serrations; those on blind side mostly smooth-edged; eyed side rough to touch.



Colour, reddish to grayish-brown on eyed side, blind side white or bluish-white; tips of dorsal and anal fins white; small plaice usually marked with dark spots along edge of body.

DISTINCTIONS: The American plaice is the only flatfish in this area with an almost straight lateral line, a large mouth, a rounded tail and the eyes on the right side.

SIZE: Usually not over 24 inches long. One plaice 32½ inches long and weighing 14 pounds was caught at Sable Island.[306]

RANGE: On both sides of the North Atlantic Ocean. From southern Labrador and the Grand Bank to off Rhode Island. Occurs off West Greenland, Iceland, Spitzbergen, and south to the English Channel.

Canadian distribution: Off Nain, Labrador (lat 56°57′N, long 62°10′W); Lake Melville, Hamilton Inlet; Bank off Hamilton Inlet.[21, 25, 451] Off Raleigh, Nfld.[209] Abundant on northern part of Grand Bank and less so elsewhere on this Bank, in Trinity Bay, off St. Mary's Bay, St. Pierre Bank, western coast of Newfoundland.[17, 18, 19, 152] Trois Pistoles region, Que.[357, 514] Abundant off Cheticamp, N.S., and the Magdalens, Que.;[95] at Gaspé;[450] in Chaleur Bay;[310] very common off Tignish, P.E.I., and in Chedabucto Bay.[91, 92] On all the Banks off Nova Scotia; most abundant on Banquereau and in a large area adjacent to Shelburne County, N.S.[310] Abundant in the Bay of Fundy, St. Mary Bay, and Passamaquoddy Bay.[205]

BIOLOGY AND ECONOMICS: The plaice lives at various depths from 20 to 390 fathoms on bottoms with fine sand or soft mud. They live in cool to cold water, not over 55 F and are able to survive at 29.5 F.[25, 203] They can tolerate somewhat lowered salinity and are found in water of 20–22‰ in Hamilton Inlet (that is, in water about $\frac{2}{3}$ of normal salinity).[25] Probably the higher temperature excludes them from brackish water farther south.

Tagging on the northern Grand Bank and at St. Mary's Bay, Nfld., did not show any appreciable migration of the adults. Survey and tagging results in the southwest Gulf of St. Lawrence showed that adults moved into deeper water in winter, where they remain in the warm-water layer until April. In spring and summer they are distributed in the cold-water layer inshore. In the Bay of Fundy migration of older fry from outside is indicated, as eggs produced there die before hatching.[203]

Female plaice mature at a length of about 18 inches, males at about 10 inches. Females produce 30,000–60,000 eggs. The eggs are spherical, from $\frac{1}{12}$ to $\frac{1}{10}$ inch in diameter, have a large perivitelline space, and they float near the surface or a short distance below depending on the salt content of the water. Spawning takes place wherever plaice live; it occurs in April and May in the Bay of Fundy, in May and June in the southern Gulf of St. Lawrence, as late as July on the Newfoundland banks, and even later on the Labrador coast.[152, 203] The eggs hatch in 11–14 days at 39 F. The fry are found widely distributed over the entire range of the adults except in the Bay of Fundy. Following spawning, many of the large plaice show a "jellied" condition in the muscle. This is due to protein wastage before and at spawning time.[473] The condition is common around Newfoundland and in the Gulf of St. Lawrence.

Growth varies in different localities and the rate differs for the two sexes. In the Passamaquoddy area female plaice 5 years old average 16 inches in length; in the southern Gulf of St. Lawrence they average 9 inches at this age, while in Bay of Islands, Nfld., they are only $5\frac{3}{4}$ inches long at 5 years.[203] Plaice from Notre Dame Bay and St. Mary's Bay, Nfld., grow at about the same rate as the Bay of Islands plaice, but those from Grand Bank grow faster, reaching a length of 12 inches in 5 years. Growth is slow in later years and plaice up to 26 years old are found on the Grand Bank, Gulf of St. Lawrence, Nova Scotian banks, and off Labrador. Such fish from the Grand Bank are about 20 inches long and those from the southern Gulf 25 inches long. Males grow more slowly and do not live as long as the females.

The pelagic fry eat diatoms and small copepods. Small plaice on bottom eat amphipods, crustaceans, caprellids, mysids, decapod shrimp, and other small benthic Crustacea. As they become larger they eat sand dollars, sea urchins, brittlestars, pelecypod and gastropod molluscs, a small admixture of shrimp, worms, sea squirts, etc.[203] Occasionally they feed on capelin, sand lance, and other small fishes.

Plaice are eaten by cod, halibut, Greenland sharks, and probably by other large fishes. Small plaice are fed on by skate, eelpout, sea ravens, and cod.

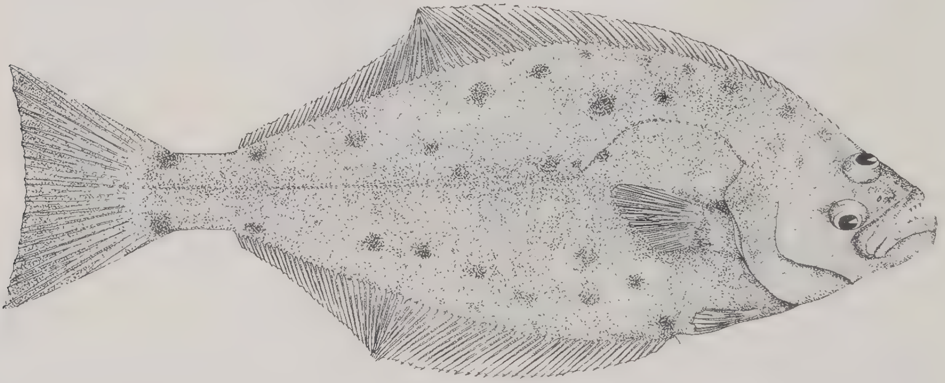
American plaice has become an important commercial flatfish in the eastern Canadian fisheries. Plaice are caught mainly by otter trawls and sometimes by Danish seines although a few are taken by longline. They are used fresh and frozen for storage.

Atlantic halibut **Flétan atlantique**

Hippoglossus hippoglossus (Linnaeus) 1758

OTHER COMMON NAMES: halibut

DESCRIPTION: Body moderately elongate, normally lying on left side, although very occasionally the reverse, width 3⅓ just behind tip of pectorals; caudal peduncle moderate. Head 4 in total length, broad; mouth large, its angle under front of eyes, lower jaw projecting, strong teeth in both jaws. Eyes projecting above surface of right side of head, except in reversed specimens, 8 in head length, widely set. Fins: dorsal (1), 92–107, beginning above eye, the rays gradually increasing in length until middle of body is reached, then decreasing, the fin ending a short distance in front of base of caudal; caudal large, its posterior end quite concave; anal 69–84, preceded by a spine-like bone, covered by skin in older specimens, similar in shape to dorsal but shorter, beginning under base of pectorals and ending under posterior end of dorsal; pectorals a short distance behind gill openings, the one on the eyed side obliquely pointed, the other on the blind side small and rounded; pelvics small, below and in front of pectorals, under gill opening. Lateral line prominent, arched above pectoral fin. Head and body covered by scales. Vent half way between base of pelvic fins and beginning of anal.



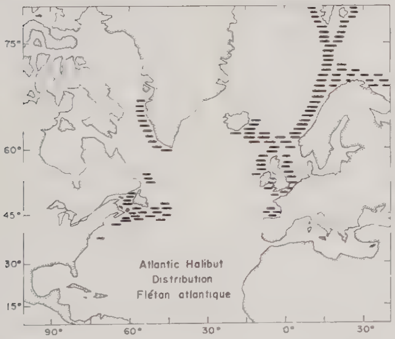
Colour, variable, upper surface greenish-brown to very dark-brown, colour continuous on dorsal, anal, and upper pectoral fins. Lower side white in small fish, gray or mottled with gray in larger halibut, sometimes suffused with red ("cherry-bellies").

DISTINCTIONS: The halibut is readily distinguished by its concave tail, a feature shared only by the Greenland halibut; all the other flatfishes in this area have rounded tails. The lateral line is arched in the halibut and straight in the Greenland halibut. While both have large mouths, that of the Greenland halibut is much larger and armed with heavier teeth.

SIZE: Occasionally 8 feet long and weighing 400 pounds. One specimen of about 700 pounds has been reliably recorded.[49] Fish 5 feet long weigh about 100 pounds.

RANGE: The halibut is a resident of the cold waters of the boreal and subarctic Atlantic. Although not abundant at the present time, it is distributed in varying numbers from a few stray fish caught off Virginia and New Jersey, the southernmost extent of its range, to the area of commercial fishing around Georges and the Nova Scotian banks, the southern part of the Grand Bank and the Flemish Cap, and in the northern part of the Gulf of St. Lawrence including the west coast of Newfoundland. Occurrences are reported along the outer coast of Labrador in waters of 70–90 fathoms, where they appear to avoid the icy Labrador current. They are not known off the arctic coasts of either North America or Asia. The west coast of Greenland provides commercial fishing for halibut as far north as Disko Bay.

On the European side of the Atlantic, they are reported definitely from as far south as the Bay of Biscay.[328] They are caught in small quantities in the Irish Sea and the English Channel, becoming more numerous northward around northern Ireland and Scotland, in the northern part of the North Sea, the Shetland–Faroes area, and Iceland. They follow the Norwegian coast northward and frequent the waters of Spitzbergen, Bear Island, and the Barents Sea.



A related species *Hippoglossus stenolepis* Schmidt is important commercially on the Pacific coast.

Canadian distribution: One specimen at Cut-throat Harbour, Labrador (lat 57°55′N).[23] Reported as common on banks off Labrador, such as the bank off Hamilton Inlet.[25] Red Bay, Strait of Belle Isle.[455] Occasional off Raleigh, Nfld.[209] Throughout Gulf of St. Lawrence, but chiefly near Anticosti and Gaspé;[283, 405] in Miramichi estuary; near Tignish, Prince Edward Island;[92] off Cheticamp, Nova Scotia.[95] Common on entire southern edge of the Grand Bank.[17, 18, 19] On Green and St. Pierre banks, and all the banks off Nova Scotia, notably on Banquereau and its edges. An inshore fishery off the Cape Sable area, Nova Scotia. In the Bay of Fundy chiefly outside of Grand Manan and on the Nova Scotian side to Minas Basin; a few small ones in Passamaquoddy Bay.[205]

BIOLOGY AND ECONOMICS: Halibut are not usually caught in water that is colder than 35 F, and there is a winter movement to deeper water and some summer movement to shallow water in areas where such temperatures occur near the surface in winter.

Two-hundred and twenty-nine halibut were tagged in deep water near Anticosti Island and on the fishing grounds off Cape Sable, Nova Scotia in 1946 and 1947.[297]

Most of the fish recaptured were caught very close to where they were tagged but there were exceptions. One halibut tagged at Anticosti in 1946 was recaptured 1600 miles away, off Iceland in 1953. Two other fish tagged at Anticosti moved into shoaler water where they were recaptured; one moved from western Anticosti to off Seven Islands, Quebec, a distance of 100 miles; the other moved from off West Point to off Southwest Point. Some movement eastward was demonstrated by fish tagged off southwestern Nova Scotia; one tagged off LaHave Bank in 1947 was recaptured 500 miles away on the southern edge of the Grand Bank in 1953; another moved from German Bank to Middle Ground; another from Browns Bank to Western (Sable Island) Bank; there was some movement from German and Browns banks into the Cape Sable area. There was some interchange between Roseway, LaHave, and Baccaro banks.[283, 296]

There is little positive evidence on the time and place of spawning of halibut on this coast, but information available suggests that spawning probably takes place in late winter and early spring, about March to May, and at depths of over 100 fathoms. European halibut are believed to spawn in deep water (400–500 fathoms).

Halibut mature when about 10 years old. A 200-pound female will produce over 2 million eggs. The eggs are spherical, $\frac{1}{8}-\frac{1}{7}$ inch in diameter. They are probably spawned on bottom, but they float, not at the surface but at depths of over 30 fathoms, because of their specific gravity. The eggs hatch in 16 days at a temperature of 43 F.[49]

Female halibut grow faster than males after the first few years, and they reach a larger maximum size. McCracken[297] found the following growth rate for halibut in the Gulf of St. Lawrence: (length in inches) *males*: age 5—24; 10—36; 15—51; 20—58; 25—61; females: age 5—23; 10—41; 15—57; 20—67; 25—73.

Similar growth rates were observed in female halibut in southwestern Nova Scotia but the males grow more slowly there.[297]

Recent food studies show that halibut feed on invertebrates and fish until they reach a length of about 70 cm, and then on fishes almost exclusively. The principal invertebrates eaten are crustaceans, crabs, decapod shrimps, and euphausiids.

Halibut are fished by means of longlines and otter trawls. Fish taken by longlines are old and large, and although fish caught by otter trawl may exceed in numbers those caught by longline, they are mainly much smaller. They are caught throughout the year except in the Gulf of St. Lawrence where ice conditions prevent winter fishing. A detailed month-by-month study of the Canadian Atlantic halibut landings was published in a Bulletin by R. A. McKenzie.[307]

The catch of halibut from the Canadian Atlantic area for 1962 was 6,118,000 pounds, with a value of $1,763,000,[70b] while the catch for the western North Atlantic for the same year was 11.3 million pounds.

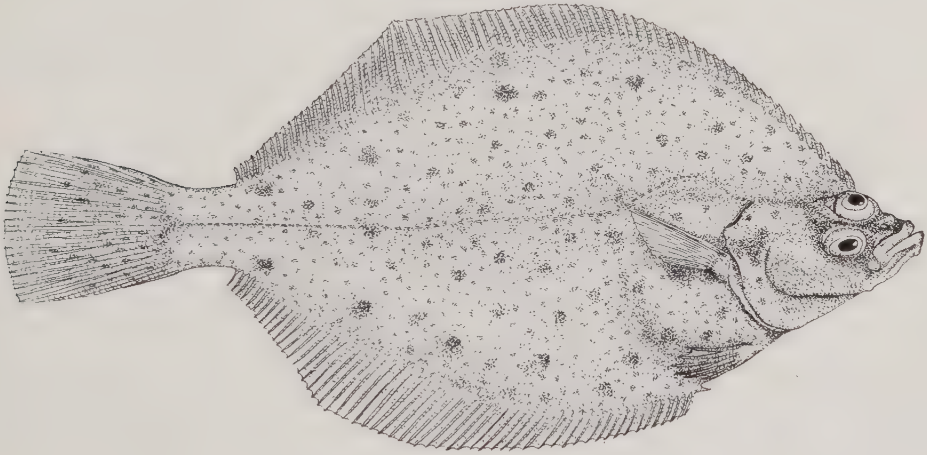
The peak of Canadian landings occurred in 1950 when 13,000,000 pounds were landed. Halibut have a much higher landed value than any other Atlantic Coast groundfish, thus making it economically feasible for fishermen to fish for and land relatively small quantities. Halibut are marketed fresh and frozen.

Yellowtail flounder **Limande à queue jaune**

Limanda ferruginea (Storer) 1839

OTHER COMMON NAMES: rusty dab, yellowtail, queue jaune, sériole

DESCRIPTION: Body ovate-elliptical, much compressed, lying on left side (very occasionally reversed); greatest width 2¾ in total length, a short distance behind tip of pectoral fins. Head 4½ in total length, snout somewhat pointed, upper profile concave, lower jaw projecting; mouth small, its angle about halfway between eye and tip of jaw, small, conical, close-set teeth in a single series in each jaw. Eyes 6 in head, closely set but separated by a high, narrow ridge. Fins: dorsal (1), 73–91, beginning above middle of left eye and extending to caudal peduncle, longest rays a little less than half length of head, located more than halfway along fin; caudal rounded; anal 55–68, a short, sharp preanal spine points forward, fin begins directly under tip of gill opening and terminates on caudal peduncle under end of dorsal, longest rays about equal to those of dorsal; pectorals inserted on sides behind gill opening, ⅓ length of head; pelvics on ventral edge in front of base of pectorals, smaller than pectorals. Lateral line arched above pectoral fins. Scales small, rough on eyed side, smooth on blind side, covering body and much of head.



Colour, of eyed side brownish-olive with numerous, irregular, rusty-reddish spots; fins similarly marked; blind side white with lemon-yellow on caudal peduncle and margins of dorsal, anal, and caudal fins.

DISTINCTIONS: The yellowtail flounder has a small mouth, which distinguishes it from all the flatfishes except the winter flounder, smooth flounder, and the witch flounder. It is readily distinguished from all of these by its arched lateral line; the other three species have a straight lateral line. The yellow colour is a convenient mark. Its snout is more pointed and its body is thinner than any of the other small-mouthed species. It has more dorsal and anal rays than the winter and smooth flounder and less than the witch flounder.

SIZE: Specimens up to 24¾ inches long are recorded for Newfoundland.[17] The largest yellowtails on record from Sable Island Bank measured 23¼ inches (female) and 19¼ inches (male).[418]

RANGE: From the Labrador side of the Strait of Belle Isle, Gulf of St. Lawrence, and Newfoundland banks to the lower part of Chesapeake Bay. It is confined to the continental shelf.

Canadian distribution: There are three records for the Strait of Belle Isle: Red Bay; Barge Bay;[209] and Forteau Bay.[25] There are specimens from St. Anthony's, Newfoundland.[49] Recorded from various points in the Gulf of St. Lawrence, viz. Gaspé, Que.;[450] Miramichi estuary, N.B.;[312] Magdalen Islands, Que., Cheticamp, N.S. and Cape Breton shore;[95] Malpeque Bay, P.E.I.[334] From St. Pierre, Green, and southern Grand banks, and the Avalon peninsula.[17, 18, 19] From Chedabucto Bay, N.S.[91] From Middle Ground, Banquereau, Sable Island, Emerald and Roseway banks.[17, 18, 19, 310, 420] St. Mary Bay, N.S.;[205] near Parrsboro, N.S.[348]

BIOLOGY AND ECONOMICS: The yellowtail flounder is caught over a range of depths from 5 to 60 fathoms but is most abundant in 20–40 fathoms. It is found on sandy and mixed sand and mud bottom. Structural differences indicate that there is no mixing of populations off Cape Cod with those of Sable Island Bank; yellowtails on Sable Island Bank and Middle Ground are not distinguishable in the same way, but differences in the ear-bone (otolith) patterns indicate that there is little, if any, intermingling.[420]

Yellowtails mature at a length of about 14 inches. On Middle Ground spawning occurs throughout June and early July. Near Cape Cod it begins in mid April and continues until early July.[420] The eggs are spherical, about .04 inch in diameter, and float near the surface. They hatch in 5 days at temperatures of 50–52 F.[49]

Yellowtails from Middle Ground and Sable Island Bank grow more slowly than those from near Cape Cod until they are 5 or 6 years old, but at 7 years both stocks are about the same size. Female yellowtails from Middle Ground and Sable Island Bank reach a length of 11¾ inches in 5 years and of 17¾ inches in 8–9 years. Males grow at a similar rate until 7 years old when their growth falls behind that of the females. Yellowtails reach an age of 11 years or more.[420]

The yellowtail flounder feeds chiefly on small Crustacea such as amphipods, shrimp, mysids, also small shellfish, marine worms, and occasionally small fishes.[49]

Yellowtails are valued as tasty food fish, and are used fresh and frozen in filleted form. They are caught chiefly by otter trawls. The small mouth prevents any but the largest being caught on line trawls.

Canadian landings for 1953 are reported in "Fisheries Statistics of Canada, 1953" only from Nova Scotia, where 1,430,000 pounds were taken. For some years previously the catch had been over 2 million pounds. The largest catches are on Middle Ground, Banquereau, and Sable Island banks.

In the United States larger catches are made on Georges Bank and Nantucket Shoals. United States fishermen take small amounts on grounds off Canada.

Smooth flounder Plie lisse

Liopsetta putnami (Gill) 1864

OTHER COMMON NAMES: eelback flounder

DESCRIPTION: Body oblong, lying on left side, greatest width 2¾ in total length, at tips of pectorals; caudal peduncle stout. Head 4¼ in total length; mouth small, its angle in front of eyes, left side of jaws with 2 distinct rows of teeth, right side toothless. Eyes 7 in head, separated by a scaleless ridge. Fins: dorsal (1), 53–59, beginning over middle of left eye and ending on base of caudal peduncle, longest rays more than ½ length of head, being the 32nd–40th rays; caudal rounded; anal 35–41, beginning a little behind a perpendicular through base of pectoral and ending on caudal peduncle under end of dorsal, longest rays almost equalling those of dorsal; pectorals inserted behind gill opening, on sides, length ⅔ that of head, shorter on blind side; pelvics on ventral edge, well in advance of base of pectorals, smaller than pectorals. Lateral line straight. Body covered with scales, as is part of head; no scales between eyes; scales smooth in females, rough in males.

Colour, grayish-brown to almost black, mottled with darker brown; fins mottled or with blackish spots; blind side white.

DISTINCTIONS: The smooth flounder is distinguished by its small mouth, eyes on right side, and straight lateral line from all flatfishes except the winter flounder and the witch flounder. It has only about half as many dorsal and anal fin rays as the witch flounder, and lacks mucous pits on the under side of the head. It is distinguished from the winter flounder by the smooth and scaleless area between the eyes (the winter flounder has scales there), and by the smaller number of anal rays (35–41) as compared to the winter flounder (44–58). The smooth flounder has longer pectoral fins than the winter flounder. Females can be distinguished by their smooth skin.

SIZE: This is the smallest of the flatfishes, not exceeding 12 inches in length.

RANGE: The smooth flounder occurs close to shore, chiefly in estuaries from Ungava Bay to Rhode Island.

Canadian distribution: Found sparingly in Ungava Bay and along the Labrador coast at Maligiak (lat 56°37′N), Kaipokok Fjord, Lake Melville, and St. Lewis Sound.[25] Plentiful at Pistolet Bay, Newfoundland.[209] Scarce around Newfoundland generally.[152] North Shore, Gulf of St. Lawrence.[49] In shallow water near Trois Pistoles, Que.;[514] Chaleur and Miramichi bays;[229, 312] Tignish, P.E.I.;[92] abundant in Malpeque Bay, P.E.I.;[334] common in shallow water at Magdalen Islands, Que., and Cheticamp, N.S.[95] Not recorded on outer coast of Nova Scotia but probably there in some inlets. Common in the estuaries of the Bay of Fundy and St. Mary Bay; in Annapolis and Minas basins.[205]

BIOLOGY AND ECONOMICS: The smooth flounder is confined to shallow estuaries and coastal areas, usually in warmer and somewhat brackish waters. It can withstand higher temperature and lower salinity than the winter flounder.[294] It must be able to live at temperatures approaching the freezing point in winter. It frequents muddy bottom and is rare on hard bottom.

Little is known of its breeding habits except that it spawns in late winter or early spring. In Minas Basin the adults feed on amphipods and small molluscs. Elsewhere they eat small crabs, shrimp, and marine worms in addition.

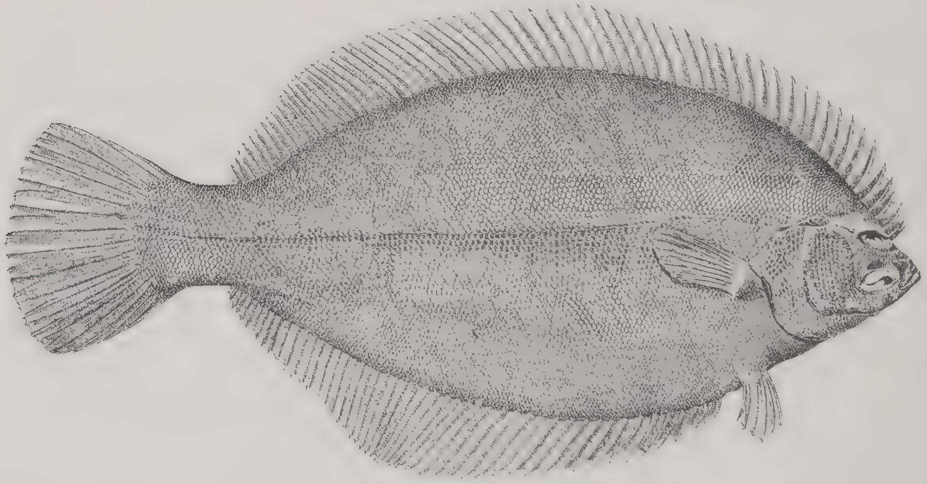
The smooth flounder is too restricted in distribution to be of much economic importance. A few hundredweights are caught annually in the southern Gulf of St. Lawrence and they are used as food for foxes.[310]

Winter flounder Plie rouge

Pseudopleuronectes americanus (Walbaum) 1792

OTHER COMMON NAMES: blackback, sole, flounder, dab, lemon sole, Georges Bank flounder, carrelet

DESCRIPTION: Body oblong, caudal peduncle heavy, lying on left side (occasionally reversed), greatest width 2⅗ in total length, a short distance behind tip of pectoral fin. Head 5½ in total length, upper profile very slightly concave; mouth small, its angle in front of eyes, small, incisor-like teeth in one row in each jaw, most numerous on blind side. Eye 4 in head, right one slightly in advance of left, separated by a scaled area about equal to transverse diameter of eye. Fins: dorsal (1), 60–76, originating above front edge of left eye and extending to caudal peduncle, rays shorter at beginning and end of fin, otherwise fairly uniform, the longest equal to ½ head length; caudal large, rounded; anal 44–58, beginning under middle of pectoral fin and ending on caudal peduncle under end of dorsal, longest rays about middle of fin, slightly longer than those of dorsal; pectorals inserted close behind gill openings, on



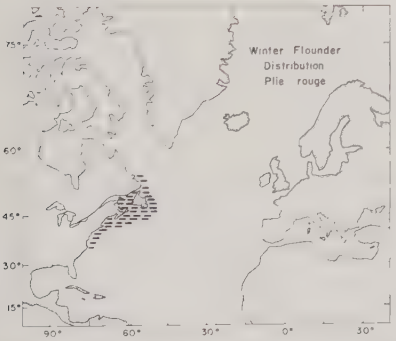
sides, rounded, slightly more than ½ length of head; pelvics inserted below and slightly in front of base of pectorals, a little smaller than pectorals. Lateral line almost straight. Rough, strongly toothed scales cover the body and upper side of head; blind side of body scaled but smooth; few scales on blind side of head.

Colour, variable. Upper side muddy or reddish-brown to almost black, sometimes spotted or mottled; blind side white, somewhat translucent or bluish near edges; under side of caudal peduncle usually white, sometimes yellowish. Very rarely the blind side is dark-coloured; more frequently it bears dark spots. The species can vary its colour and pattern somewhat, depending on the characteristics of the bottom where it is living.

DISTINCTIONS: The winter flounder is distinguished by its small mouth, eyes on the right side, and straight lateral line, from all species of flatfishes except the smooth flounder and the witch flounder. It is distinguished from the smooth flounder by the scales between the eyes, which the smooth flounder lacks. It is distinguished from the witch flounder by having no pits on the under side of the head, as the witch flounder has, and by the lesser number of rays in the dorsal and anal fins. It has 60–76 dorsal rays as against 100–115 for the witch flounder, and 44–58 anal rays as against 87–100 for the witch flounder.

SIZE: Vladykov and McKenzie[513] report a winter flounder caught on Western Bank by the steam trawler *Viernoe* in September 1934 that was 25 inches long and weighed 8 pounds. Inshore specimens are much smaller and fish caught inshore or offshore seldom exceed 18 inches in length.

RANGE: The winter flounder is distributed along the Atlantic coast of North America from the inshore to the offshore fishing grounds (20 fathoms and less), from as far north as Battle Harbour and Windy Tickle, Labrador (lat 55°45′N), southward through the Strait of Belle Isle and along the north shore of the St. Lawrence. Although abundant only in the central portion of its range,[295] it is present along the coasts of Nova Scotia, south and southeastern Newfoundland and the southern part of the Grand Bank, to its southern extent off North Carolina and Georgia. Backus[25] has indicated that reports of this species from Ungava Bay are in error.



Canadian distribution: Several specimens have been reported from the coast of Labrador: at Windy Tickle, Emily Harbour, Rigolet, Lake Melville, St. Lewis Sound, and Battle Harbour.[25] Reported from Red Bay[240] and Raleigh, Nfld.[209] in the Strait of Belle Isle. On the Newfoundland coast at Trinity Bay, Bay of Islands, Port-au-Port Bay, and Bay Bulls.[17, 18, 228] From Trois Pistoles region, Quebec;[514] Anticosti;[405] Cascapedia Bay, Gaspé;[229] lower Miramichi River and Bay;[312] Tignish, P.E.I.;[92] Malpeque Bay, P.E.I.;[334] abundant at Magdalen Islands, Que., and Cheticamp, N.S.[95] Common near Canso, N.S.;[91] everywhere along the Nova Scotian coast.[310, 513] Abundant throughout the Bay of Fundy and St. Mary Bay.[205] It occurs on southwestern Grand Bank and on all the Banks off the Nova Scotia coast.[310]

BIOLOGY AND ECONOMICS: The winter flounder inhabits soft muddy to moderately hard bottom in depths of 1–20 fathoms but is known down to 50 fathoms in winter in the Bay of Fundy; it was found down to 78 fathoms in Chedabucto Bay, N.S.[295] It is tolerant of a wide range of temperatures but is most abundant where water temperatures are between 53 and 60 F. At the southern end of its range such temperatures occur only in winter, and this flounder is near shore only at such times, hence the name "winter flounder." Whether the fish in any locality leave shore in summer or not, depends on whether the water temperature reaches 60 F. This species can also tolerate lowered salinity and penetrates into brackish water at times. Low temperature will cause the adults to move off into deeper water in winter. Young specimens do not move as far. In Passamaquoddy Bay the winter flounders leave shore for deeper water in November and they return in April.

Winter flounders have been tagged in St. Mary Bay and many were recaptured in ensuing years. There was some spreading within the Bay but no tagged fish were caught outside it; this indicates that no extensive movement occurs.[295] A similar situation was described for winter flounder populations in Long Island Sound.[349]

Winter flounders spawn in shallow water in late winter and spring. South of Cape Cod spawning is at its height in February and March but to the north the season is later. Ripe fish are found in April and May in Canadian waters.[295] In Passamaquoddy Bay freshly spawned eggs were found in late May.[428] Female winter flounders can produce up to 1,500,000 eggs, but the average is about one-third of this. The eggs are spherical, about .03 inch in diameter. They are heavier than sea water and sink to bottom where they adhere in clusters. Hatching requires about 26 days at 40 F and about 18 days at 60 F.[428]

The growth rate of winter flounders varies with locality. Growth in St. Mary Bay is more rapid than it is elsewhere in Canadian waters, and is similar to that made at Cape Cod. The slowest growth has been observed in Passamaquoddy Bay. The average growth is as follows:[295] In St. Mary Bay, 2-year-old fish attain a length of 7 inches; 5-year-olds, 14¾ inches; 7-year-olds, 16¼ inches; 8-year-olds, 16¾ inches. In Passamaquoddy Bay, 2-year-old fish attain a length of 4½ inches; 5-year-olds, 10 inches; 7-year-olds, 12¼ inches; 8-year-olds, 12¾ inches. Females grow slightly faster than males.

Full-grown winter flounders from the Minas Basin area feed on amphipods, isopods, and marine worms (*Nereis*). In Passamaquoddy Bay their diet is similar with the addition of small soft-shelled clams (*Mya*), other small bivalves, snail eggs, and some seaweed. Elsewhere they are reported to eat small crabs and shrimp. They nip off and eat the protruding siphons of the soft-shelled clam.[319] They act as scavengers when opportunity affords.

Winter flounders are caught inshore in a variety of ways—with baited hooks, spears, fyke nets, shut-off seines, and in smelt traps. Offshore they are caught in flounder drags and otter trawls. They are used for human consumption as fresh or frozen fillets; they are also used for fox food.

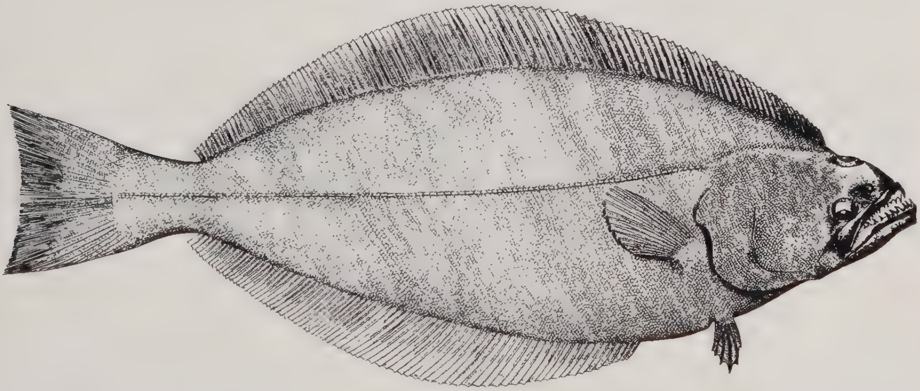
The catch of winter flounder from the Canadian Atlantic area for 1962 was 642,000 pounds, with a value of $17,000.[70b]

Greenland halibut **Flétan du Groenland**

Reinhardtius hippoglossoides (Walbaum) 1792

OTHER COMMON NAMES: turbot, Newfoundland turbot

DESCRIPTION: Body moderately elongate, lying on left side; greatest width 3⅓ in total length, just behind tip of pectorals; caudal peduncle moderate. Head 4 in total length, dorsal profile convex, making a shallow notch at beginning of dorsal fin; mouth large, its angle below posterior edge of eye, strong conical teeth in both jaws, there being 2 rows at front of upper jaw and one row elsewhere; lower jaw projecting. Eyes 8 in head, on right side, widely spaced. Fins: dorsal (1) about 100, beginning about ½ diameter of left eye behind it and extending to caudal peduncle, central rays longest and about ⅓ of head length; caudal very slightly concave; anal about 75, no pre-anal bony spine, beginning under middle of pectoral fin and ending under posterior end of dorsal, its middle rays longest, equal to those of dorsal; pectorals rounded, base about midway between lateral line and ventral edge, with some space between it and gill opening, slightly less than ½ length of head; pelvics much smaller than pectorals, inserted on ventral edge, somewhat in front of base of pectorals. Lateral line almost straight. Head and body covered with small, cycloid scales.

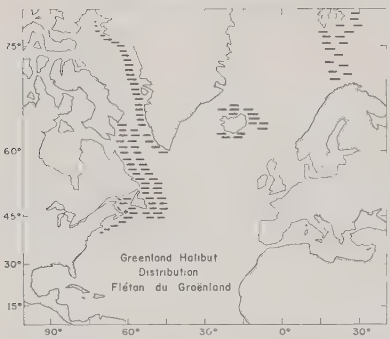


Colour, yellowish or grayish-brown, blind side pale gray.

DISTINCTIONS: Distinguished from all flatfishes except the halibut, by having a concave tail and not a rounded one. The lateral line is almost straight in the Greenland halibut but strongly arched in the common halibut. The Greenland halibut has a larger mouth and stronger teeth than the Atlantic halibut.

SIZE: Up to a length of 40 inches and a weight of 25 pounds.[49]

RANGE: The Greenland halibut, a deep-water fish inhabiting the arctic and north Atlantic regions, ranges on the North American side of the Atlantic from a point off Cape Mercy, Baffin Island to the southwestern edge of Georges Bank. Breder[66] extends the range to the deep waters off New Jersey. A considerable quantity is taken off the south coast of Newfoundland and on the Grand Bank, and a fishery is supported on the northwest coast of Greenland.[214] Odd specimens have been reported in the Gulf of St. Lawrence, near Trois Pistoles,[514] and off southwest Iceland. It occurs in the waters off northern Iceland and to the Faroes ridge, and is taken off Spitzbergen south to the coast of northern Norway. In Soviet waters it is encountered in the western part of the Barents Sea but rarely in the Baltic.



Canadian distribution: Many small specimens, up to 5 inches in length, taken from cod stomachs at Port Burwell at the eastern tip of Ungava Bay; similar specimens were trawled in the adjoining Forbes Sound.[124] Two small specimens of 3–4 inches trawled in 70 fathoms at Hebron fjord, Labrador, in 1954.[172] Common in Trinity and Notre Dame bays and offshore from Trinity Bay; in Conception Bay; on the northern edge of the Grand Bank and in Fortune Bay, Newfoundland.[17, 19] Trois Pistoles region, Quebec.[514] Not common off Canso, Nova Scotia, in 50 fathoms or more.[91] Occasional on northern fishing banks off Nova Scotia.[232] Along the slope of LaHave Bank in 300—350 fathoms.[49]

Biology and Economics: This fish is confined to deep water on the colder parts of the coast. It is fished commercially in Newfoundland, where in 1953 a little over 1 million pounds were landed. It is used fresh and salted.

Order DISCOCEPHALI (Echeneiformes)—Sharksuckers

The sharksuckers are a small order of carnivorous fishes, closely related to the percomorphs, but peculiarly modified by having the first or spinous dorsal fin transformed to a flat, oval disc, with transverse laminae—a disc that is composed of small compartments and that serves as a sucking or adhesive organ. The disc can be operated by its owner to anchor or afix itself to any smooth object, such as a shark, a boat or a porpoise and is so constructed that the harder the backward pull, the firmer the attachment. Sharksuckers are small, terete fishes with thoracic pelvics, occurring in warm seas.

The 10 or more species are classified in a single family, Echeneidae. Three species have been recorded from our area.

KEY to Family ECHENEIDAE

1 Disc laminae more than 20 (20–28); pectoral fins more or less pointed; body rather slender .... Sharksucker, *Echeneis naucrates* (p. 403)

Disc laminae less than 20 (usually 14–18); pectoral fins rounded; body rather stout 2

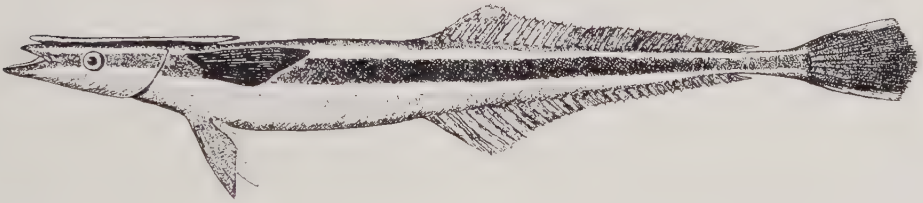
2 Disc laminae 14–16; soft dorsal fin rays 29–32 .... Spearfish remora, *Remora brachyptera* (p. 404)
Disc laminae usually 18 (16–20); soft dorsal fin rays 22–25 .... Remora, *Remora remora* (p. 405)

Sharksucker **Naucrate**

Echeneis naucrates Linnaeus 1758

Other common names: pilot sucker

Description: Body elongate, rounded, greatest depth 10 in total length, at tip of pectoral fin, tapering gradually to a small caudal peduncle. Head 5⅔ in total length, flattened above; mouth terminal, lower jaw projecting markedly, small, angle much in front of eye, jaws armed with many small pointed teeth. Eye small, 8 in head. Fins: dorsals (2) 1st XX–XXVIII, greatly modified to form an oval sucking disc on top of head, extending from just behind tip of upper jaw to above middle of pectoral fin, disc slightly narrower than head, spines modified into transverse plates that, with the membranous edge, form an adhering mechanism, 2nd dorsal 32–41, first few rays graduated, 4th about 3 in head, the remainder progressively shorter, fin begins about middle of body and extends to caudal peduncle, base twice as long as head; caudal moderate, middle rays longest in young fish but fin lunate in old specimens; anal 31–38, under and similar in length and shape to 2nd dorsal except that anterior rays are a trifle longer in the anal, making the profile more concave; pectorals more or less pointed, high on sides, longest rays 1¼ in head, a short space between base and gill opening; pelvics pointed, longest rays 1¾ in head, located ventrally under bases of pectorals, inner rays attached to skin of abdomen for a very short distance. Lateral line indistinct.



Colour, slaty or dark brownish-gray; belly almost as dark as back. A broad sooty stripe with white edges runs from tip of snout, through eye and base of pectorals, and along sides to tail. Caudal fin black with whitish corners; other fins dark with pale or whitish margins.

Distinctions: The flat sucking disc with transverse plates on top of the head immediately identifies the sharksucker and the remoras. The sharksucker has pointed pectoral fins, and there is only a slight attachment of the pelvic fins to the abdomen along their inner edges, whereas the pectoral fins of the remoras are rounded and the pelvic fins are attached to the abdomen along over half of their inner edge. The white-edged black stripe on the side occurs only on the sharksucker.

SIZE: Up to a length of 38 inches.

RANGE: Cosmopolitan in warm seas, straying north on the Atlantic coast of North America, occasionally to the Gulf of Maine and rarely to Halifax, Nova Scotia.

Canadian distribution: Many years ago a specimen was reported in a Halifax Museum, presumably caught somewhere off Nova Scotia.[232] In the autumn of 1928 a 26½-inch specimen was caught on a line trawl near Herring Cove in the entrance to Halifax Harbour.[264, 513]

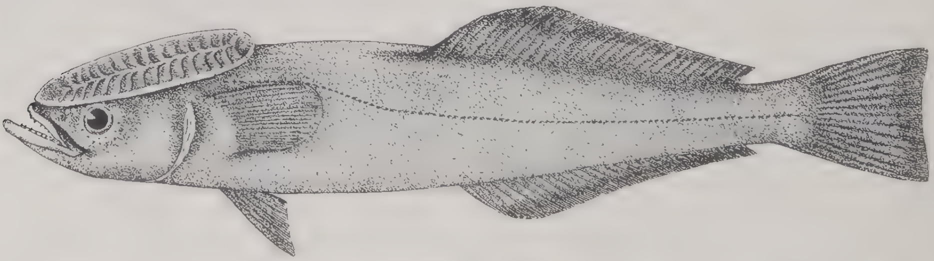
BIOLOGY AND ECONOMICS: By a slight erection of the sucker plates a series of vacuum chambers are produced, enabling the fish to adhere to sharks, ships and marine turtles. Probably brought north by such means.

Spearfish remora **Rémora brun**

Remora brachyptera (Lowe) 1839

OTHER COMMON NAMES: swordfish sucker

DESCRIPTION: Body elongate, rounded in cross-section, greatest depth 7 in total length, occurring midway between end of pectoral and beginning of 2nd dorsal, tapering to a moderately stout caudal peduncle. Head 4½ in total length, pointed; mouth terminal, lower jaw projecting markedly, angle of mouth almost reaching level of front of eye, small, pointed teeth in jaws. Eye moderate, 6 in head. Fins: dorsals (2) 1st XIV–XVI, modified to form an oval sucking disc, the spines being modified to transverse plates, which with a membranous rim form the disc, beginning just behind tip of upper jaw the disc extends to above middle of pectoral fin, being slightly longer than head and almost as broad as head, 2nd dorsal 29–32, first 3 rays graduated, 4th ray 2¾ in head, remaining rays gradually shorter, fin begins just before midpoint of total length and extends to caudal peduncle, base 1⅓ times length of head: caudal moderate, very slightly concave; anal 25–30, almost identical in shape to 2nd dorsal and under it; pectorals rounded, longest rays 2¾ in head, on middle of side, base a short distance behind gill opening; pelvics roughly triangular, longest rays 2¾ in head, inner ray attached to abdomen for more than ½ its length, base located ventrally under middle of base of pectorals. Lateral line present, arched above pectoral fin.



Colour, light reddish-brown above and darker below, dorsal and anal fins paler but not edged with white.[49]

DISTINCTIONS: The spearfish remora, like the sharksucker and remora, is easily recognized by the oval sucking disc on top of the head. It is a stouter fish than the sharksucker and has rounded pectoral and pelvic fins that are attached to the abdomen along much of their inner edge, as opposed to the pointed pectorals and almost free pelvics of the sharksucker. It differs from the remora in having only 14–16 plates in the sucking disc and 29–32 soft dorsal rays as against 18–20 plates and 22–25 soft rays in the remora.

SIZE: Up to a length of 12 inches.

RANGE: Cosmopolitan in warm and temperate seas; occasional north of Cape Cod to Halifax, Nova Scotia.

Canadian distribution: Only two records are known. Taken once on the edge of the continental shelf between Emerald and LaHave banks at lat 42°40′N, long 63°06′W;[234] specimen in United States National Museum, Washington, D.C. Another specimen, now in the St. Andrews Biological Station collection was caught at Ketch Harbour, in the approaches to Halifax Harbour in August 1950. It was attached to an ocean sunfish (*Mola mola*).

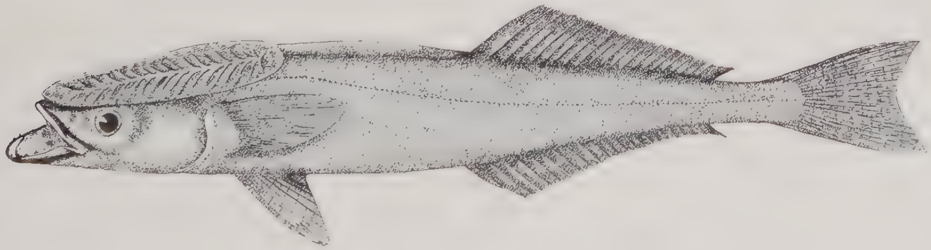
BIOLOGY AND ECONOMICS: The spearfish remora adheres to the outer surfaces of swordfish. They have also been found in the mouths of large sharks and in the gill cavities of sharks and ocean sunfish.[49]

Remora **Rémora noir**

Remora remora (Linnaeus) 1758

OTHER COMMON NAMES: blue sharksucker

DESCRIPTION: Body elongate, rounded in cross-section forward, somewhat compressed posteriorly, greatest depth 8 in total length, occurring just behind tip of pectoral fins, tapering thence to a small caudal peduncle. Head 4⅓ in total length, mouth terminal, lower jaw projecting, angle of mouth under anterior edge of eye, small pointed teeth in jaws. Eye moderate, 5½ in head. Fins: dorsals (2) 1st XVI–XX, modified into an oval sucking disc, the spines altered to transverse plates, disc begins slightly behind tip of upper jaw and ends over posterior third of pectorals, being 1⅓ times length of head and almost as broad as head, 2nd dorsal 22–25, first 3 rays graduated, 4th and 5th rays longest, being 2¼ in head length, remaining rays gradually shortening, fin begins somewhat behind middle of body and ends on caudal peduncle, base equalling head length; caudal moderate, lunate; anal 25, similar in outline to 2nd dorsal and located under it; pectorals rounded, longest rays 2 in head, base midway between lateral line and ventral edge and a short distance behind gill opening; pelvics triangular, longest



rays a little less than 2 in head, inner rays attached to abdomen along almost entire length, bases situated ventrally under bases of pectorals. Lateral line present.

Colour, uniformly brownish or blackish on all parts of body, including fins.

DISTINCTIONS: The remora is a stouter fish than the sharksucker, from which its rounded pectoral fins and adhering pelvic fins distinguish it. It has more plates in the sucker than the spearfish remora (16–20 as against 14–16) and fewer rays in the second dorsal (22–25 as against 29–32).

SIZE: Up to 18 inches in length.

RANGE: Cosmopolitan in warm seas, north to New York and San Francisco; and in the western Atlantic straying past Cape Cod as far as St. Pierre Bank.

Canadian distribution: The remora has been recorded twice from St. Pierre Bank: August 1936 at lat 45°50′N, long 56°00′W, from a blue shark[313] and October 1937 from the northwest part of St. Pierre Bank, from a small shark.[304] In September 1934 another one was caught west of Sable Island at lat 44°10′N, long 60°45′W, and a fourth specimen was caught in June 1933, 10 miles off Cape Sable, Nova Scotia.[498]

BIOLOGY AND ECONOMICS: Remoras are usually found attached to large sharks or to sea turtles. Sometimes they cling to the bottom of ships.[49]

Order PLECTOGNATHI (Tetraodontiformes)

Triggerfishes, trunkfishes, puffers, headfishes

This order includes many fishes of bizarre appearance, mostly forms from warm, shallow seas. Such forms as the filefishes, triggerfishes, porcupine fishes, boxfishes, and headfishes or ocean sunfishes, are included. These are spiny-rayed fishes in which the mouth is usually small but the jaws strong, and the teeth often beak-like. In all families but one the premaxillaries and maxillaries are fused, gill openings small, pelvic fins absent or reduced, and the body covering takes a variety of forms, such as spines or spinules, bony plates, hexagonal plates, complete rigid bony sheath or naked.

Some 200 species have been described classified in about nine families, but only 11 species representing five families have strayed into our area. None could be said to be permanent residents.

Family MONACANTHIDAE* Filefishes

The filefishes constitute a rather distinct family unit, bony fishes closely allied to the triggerfishes (Balistidae) but distinct in a number of characters, of which the dorsal spines (one large plus one smaller at times in filefishes; 3 dorsal spines in triggerfishes) and the body covering (scales minute, not in regular series nor in contact, in filefishes; scales small, overlapping and in regular series in triggerfishes) are the most obvious. In addition, the soft-rayed fins, dorsal, anal, and pectoral rays, are simple in the filefishes and branched in the triggerfishes. Larval filefishes are strongly laterally compressed while larval triggerfishes are rotund.

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* We follow Fraser-Brunner [144a] and Berry and Vogele[42] in recognizing two families, Balistidae and Monacanthidae.

The filefishes are essentially tropical forms found in shallow waters around coral reefs, often in great abundance, but many species wander northward and four species have been reported from our area.

KEY to Family MONACANTHIDAE

1 Anal fin rays usually fewer than 35; a prominent external spine extending from pelvic bone 2

Anal fin rays usually more than 35; external pelvic spine absent or rudimentary 3

2 Two to four pairs of enlarged spines on each side of caudal peduncle; ventral flap relatively large; dorsal fin soft rays not elongated .... Fringed filefish, *Monacanthus ciliatus* (p. 409)

Caudal peduncle without paired spines; ventral flap small; 2nd dorsal fin ray elongated in mature males . Planehead filefish, *Monacanthus hispidus* (p. 410)

3 Dorsal fin rays 32–39; anal fin rays 35–41; orange spots few or many .... Orange filefish, *Alutera schoepfi* (p. 407)

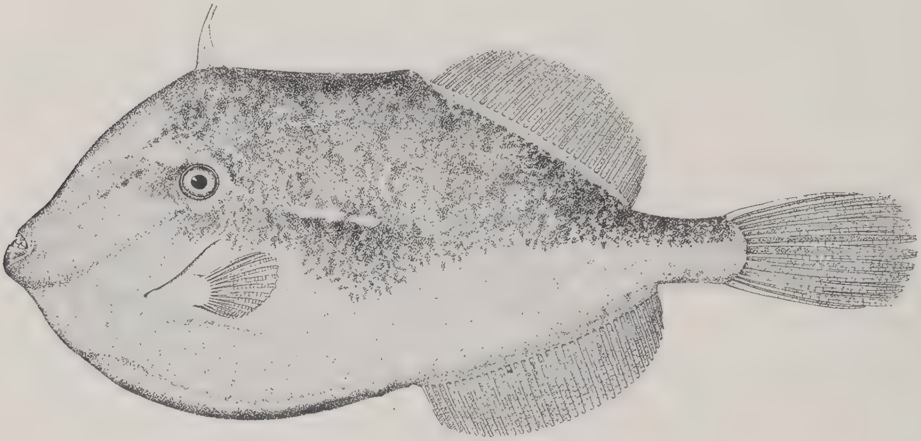
Dorsal fin rays 43–49; anal fin rays 46–52; no orange spots but dark green scrawled markings or spots .... Scrawled filefish, *Alutera scripta* (p. 408)

Orange filefish — Alutère orangé

Alutera schoepfi (Walbaum) 1792

Description: Body somewhat oblong, greatest depth slightly more than 2½ in total length, more in young, occurring at middle of pectoral fin, compressed; caudal peduncle rather small. Head scarcely distinguishable from body, the gill slit occupies an oblique position, below and in front of the eye and above the base of the pectoral fin, its length 3 times diameter of eye, profile steep; snout bluntly rounded, mouth almost terminal, very small, lower jaw projecting, incisor-like teeth in jaws, the lower ones directed obliquely backward to meet the protruding upper ones. Eye small, 6 in distance from snout to posterior end of gill slit, located above posterior part of gill slit. Fins: dorsals (2), 1st I, a moderate spine, rough but not barbed, its length twice diameter of eye, above which it is located, 2nd dorsal 32–39, middle rays longest, a little more than twice diameter of eye, first and last rays shorter giving fin a low, rounded appearance, its base almost 4 in total length of fish, interspace between it and spine equals length of soft fin; caudal moderate, rounded; anal 35–41, same shape and height as 2nd dorsal, origin directly under that of 2nd dorsal but anal is slightly longer and ends a little farther back on caudal peuncle; pectorals small, rounded, longest rays twice diameter of eye, base under middle of gill slit; no visible pelvic fins, hidden pelvic bone prolonged, as in other filefishes. Lateral line indistinct. Scales very small, rough, uniform in size over whole body.

Colour, varies from uniform olive-gray to a rich orange-yellow, the young mottled above with dark-bluish or dull-orange; caudal fin sometimes dusky, edged with white, but usually dull yellowish.



DISTINCTIONS: The orange filefish can be distinguished from the planehead filefish and fringed filefish in having a smaller eye and by the absence of a dewlap. It differs from the scrawled filefish in having fewer dorsal and anal fin rays, 32–39 and 35–41, respectively, as compared to 43–49 and 46–52 in the scrawled filefish.

SIZE: Up to a length of 24 inches.

RANGE: The Gulf of Mexico and Atlantic coast of the United States to Cape Cod, straying occasionally to Maine and north to Halifax, N.S.

Canadian distribution: A small, poorly preserved specimen just under 4 inches long caught at Herring Cove, N.S., in August, 1938, was thought to belong to this species.[304] A specimen 18½ inches long was caught at Peggy's Cove, N.S., in August 1955.[265]

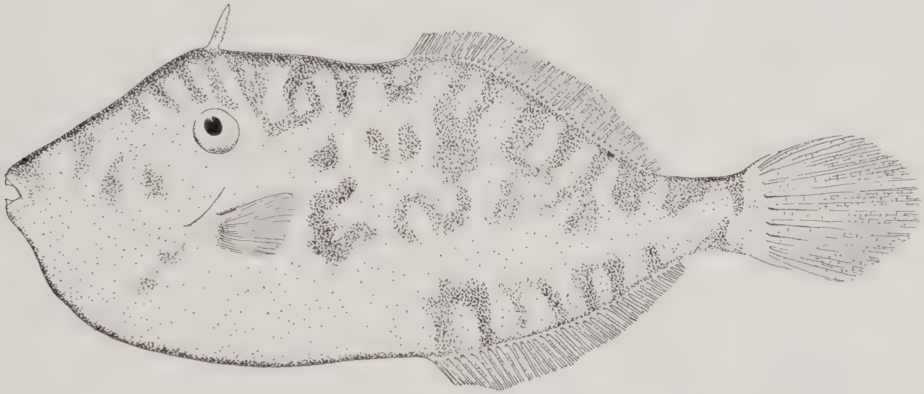
Scrawled filefish **Alutère écrit**

Alutera scripta (Osbeck) 1757

OTHER COMMON NAMES: unicorn fish

DESCRIPTION: Body oblong, greatest depth 3 in total length, occurring about middle of pectoral fin, compressed; caudal peduncle small. Head 4⅓ in total length, profile steep and almost straight from upper jaw to base of dorsal spine; mouth terminal, very small, incisor-like teeth in each jaw; gill slit oblique, its length 1½ times eye diameter. Eye 5 in head, located far back on side of head. Fins: dorsals (2) 1st I, this spine short but strong, toothed in young specimens only, its length slightly greater than diameter of eye, over which it stands, 2nd dorsal 43–49, middle rays longest, about equal to eye diameter, fin begins nearly the head length behind spine and continues to caudal peduncle, base length 6 times diameter of eye; caudal moderate, rounded; anal 46–52, under and similar in size to 2nd dorsal, but a trifle longer; pectorals rather small, end rounded, longest rays about twice diameter of eye in length, base behind lower half of gill slit; pelvics not externally evident. Lateral line not apparent. Scales small, velvety.

Colour, of head and body olive with green reticulations extending from snout to tail; numerous round black spots on body; dorsal and anal fins yellowish; caudal fin reddish.



DISTINCTIONS: The scrawled filefish can be distinguished from the orange filefish by its somewhat more slender shape and by its having more than 41 dorsal and anal fin rays (see also orange filefish).

SIZE: Up to a length of 3 feet.

RANGE: Tropical seas; from the West Indies to South Carolina, straying to Georges Bank and just south of Sable Island.

Canadian distribution: There is a single record from the Canadian zone. One specimen 5 inches long was caught by the *Atlantis* south of Sable Island at lat 40°55′N, long 59°55′W, in August 1941.[49]

Fringed filefish **Lime frangée**

Monacanthus ciliatus (Mitchill) 1818

DESCRIPTION: Body short and deep, greatest depth slightly less than 2 in total length occurring about middle of interspace between dorsal fins, much compressed; caudal peduncle small, compressed, adults with 2 or 3 pairs of strong, forward-curving spines on sides. Head about 4 in total length, somewhat triangular, upper profile slightly concave; snout somewhat rounded and protruding, mouth terminal, very small, 2 rows of incisor-like teeth in upper jaw, 6 in outer and 4 in inner row, about 6 teeth in a single series in lower jaw; gill slit very short, between eye and base of pectoral fin. Eye large, 3⅖ in head, located high and far back on head. Fins: dorsals (2) 1st I, a very strong spine, with 2 rows of barbs on posterior edge, its length about 3 times diameter of eye, located over posterior edge of eye, 2nd dorsal, about 30, first ray never prolonged, middle rays longest equalling eye diameter, first and last rays shorter, fin begins about length of head behind the spine and extends to caudal peduncle, making its base about 1¼ times the head length; caudal moderate, rounded; anal about 30, 3rd and 4th rays longest, about equal to eye diameter, other rays gradually shorter, fin located under 2nd dorsal but slightly shorter; pectorals moderate, upper angle pointed, lower edge rounded, longest rays 1¼ times eye diameter, base below and behind gill opening; pelvics reduced to a rough, embedded spine on ventral edge, below and slightly behind tip of pectoral, inner edge of spine joined to a large dewlap, that extends to the vent and projects considerably behind the line joining the tip of the pelvic spine to the vent. Lateral line not apparent. Body covered with small scales; larger scales on dewlap.

Colour, variable, from dull olive-gray to vivid, grass-green, with darker blotches or cross-bands; dorsal and anal fins pinkish, often with dark spots near bases; caudal fin greenish; dewlap edged with scarlet.

Distinctions: The fringed filefish is readily distinguished by the concave dorsal profile of the head, the spines on the caudal peduncle, and the enlarged dewlap. The orange filefish lacks any dewlap (see also orange filefish).

Size: Up to 8 inches in length.

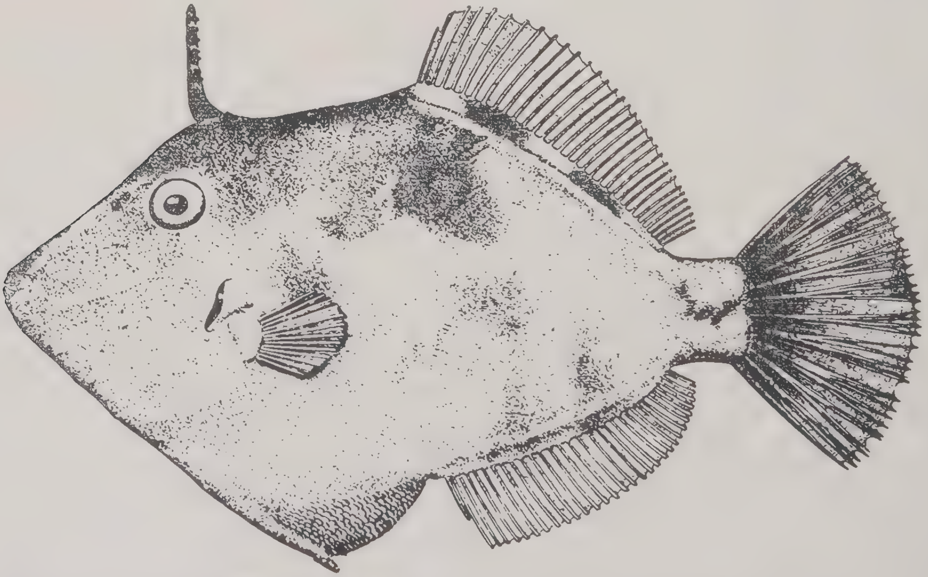
Range: Tropical parts of the Atlantic Ocean. Found from Cape Cod to Brazil and once straying to the south coast of Newfoundland.

Canadian distribution: It has been recorded only once—at Argentia, Nfld., in August 1932.[18]

Planehead filefish Lime à grande tête

Monacanthus hispidus (Linnaeus) 1766

Description: Body short and deep, greatest depth 2 in total length occurring midway between dorsal spine and 2nd dorsal fin, much compressed; caudal peduncle moderate, compressed. Head triangular, 4 in total length, upper and lower profiles almost straight, mouth very small, terminal, its length much less than eye diameter, upper jaw with 2 rows of converging and protruding incisor-like teeth, about 6 in the outer and 4 in the inner series, lower



jaw with a single row of about 6 incisors; gill opening short, below and behind eye, its length about equal to eye diameter. Eye 4 in head, located high on side of head. Fins: dorsals (2), 1st I, a very strong spine, its rear edge armed with a double series of barbs, its length slightly more than twice diameter of eye, located above posterior edge of eye, 2nd dorsal 32–34, first ray often much prolonged as a filament in adults, otherwise 7th to 10th rays longest, being slightly less than length of spine, first and last rays somewhat shorter, fin begins over mid-point of body and ends at caudal peduncle, the base 2⅓ times the length of dorsal spine; caudal moderately large, rounded; anal 31–34, slightly lower than 2nd dorsal, lacking any filamentous ray, same shape as 2nd dorsal, under which it is situated; pectoral moderate, end rounded, base a short distance behind and slightly below gill opening; pelvic reduced to a spine on ventral edge below posterior part of pectoral, the supporting pelvic bone connected to the body by a dewlap that extends to vent. No obvious lateral line. Scales small, completely covering head and body, those on dewlap somewhat larger.

Colour, greenish, olive or brownish. Young specimens mottled with darker; adults plain.

DISTINCTIONS: This filefish can be separated from the closely related species, fringed filefish, *M. ciliatus*, by its straight dorsal head profile and by the dewlap that does not extend perceptibly beyond a line joining the vent and the tip of the pelvic spine; *M. ciliatus* has a concave dorsal profile and a dewlap that extends considerably beyond the line indicated. The presence of the protruding pelvic spine and dewlap distinguish it from the orange filefish that lacks both.

SIZE: Up to a length of about 10 inches.

RANGE: Found on both sides of the Atlantic Ocean. From Halifax, N.S., to Brazil; uncommon north of Cape Cod. Found at the Canary Islands and Madeira.

Canadian distribution: The planehead filefish has been found only as a stray off the Canadian east coast. One was caught in Halifax Harbour, N.S., in 1928.[264] Three were caught in September 1950, one at Ketch Harbour, N.S.; one at Shelburne, N.S.; and one at Wilson's Beach, Campobello, N.B. One was caught off Lockeport, N.S., in August 1953. All were small specimens under 5 inches long.[265]

Family BALISTIDAE — Triggerfishes

The triggerfishes are closely related to the filefishes and are distinguished from them by a number of readily observable characters as outlined in the family Monacanthidae (p. 406).

Like the filefishes, the triggerfishes are essentially tropical forms that occasionally stray northward into our area. Two species have been reported.

KEY to Family BALISTIDAE

Lateral line complete; body colour usually brown to gray; blue spots on dorsal, caudal and anal fins .... Gray triggerfish, *Balistes capriscus* (p. 412)

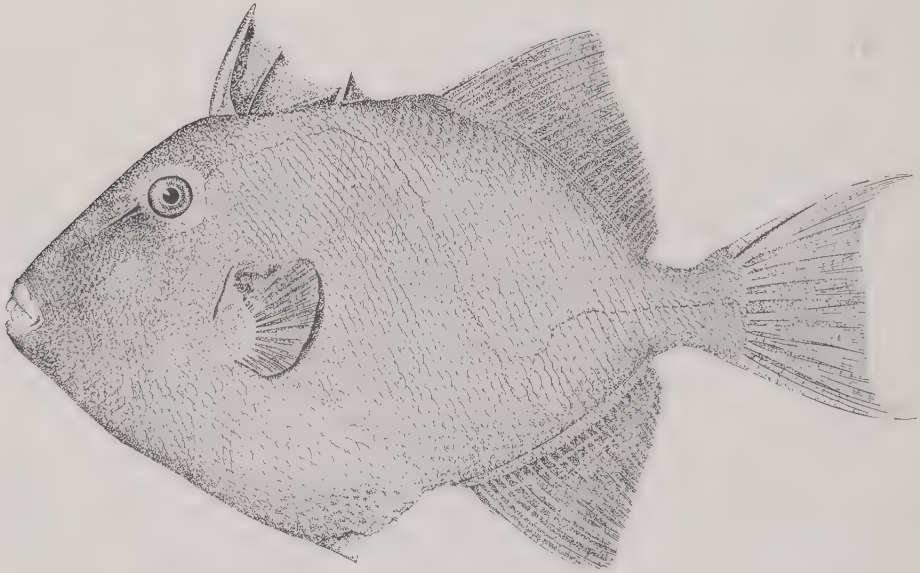
Lateral line incomplete; 2 broad, blue lines on face and some radiating from eyes .... Queen triggerfish, *Balistes vetula* (p. 413)

Gray triggerfish **Baliste gris**

Balistes capriscus Gmelin 1789

Other common names: triggerfish

Description: Body short, deep, greatest depth $2\frac{1}{5}$ in total length, much compressed, caudal peduncle relatively small, compressed; head triangular, upper and lower profiles almost straight, 4 in total length, its posterior edge marked only by a short gill slit above the base of the pectoral fin; mouth terminal, small, lips thick, angle of mouth only about diameter of eye from tip of snout, 4 incisor-like teeth on each side of each jaw, somewhat protruding. Eye 5 in head, situated high on side, about twice its own diameter above upper end of gill slit. Fins: dorsals (2), 1st III, first spine very heavy, half length of head, locks in upright position but may be depressed by touching 3rd spine, 2nd spine lighter, $\frac{3}{4}$ length of first and acting as lock for first spine, 3rd spine $\frac{1}{3}$ length of first, fin begins slightly behind eye, base length about $\frac{4}{5}$ length of head, 2nd dorsal, about 27, second ray $\frac{4}{5}$ length of head, rays then gradually decreasing so that last are about 8 in head, fin begins a short distance behind 1st dorsal and ends at base of caudal peduncle; caudal large, truncate with dorsal and ventral lobes extended and pointed; anal about 25, similar in shape and a trifle smaller than 2nd dorsal, under which it is situated; pectorals rounded, upper rays longest being $2\frac{1}{2}$ in head, base a little below middle of side and just below gill slit; pelvics small, reduced to a single embedded spine forming a sort of dewlap, located on ventral edge of body, somewhat behind tip of pectoral. Lateral line faint, best seen when scales are dry, passing along cheeks below eye, thence high on side to interspace between dorsals where it dips sharply toward the middle of anal, then rising again and running along middle of caudal peduncle. Head and body covered with scales that are heaviest and armor-like below a line joining the eye, lower edge of pectoral fin and the vent; a naked groove in front of the eye.



Colour, variable; usually brownish-gray with small violet spots on upper part of back, usually a ring of blue spots, alternating with olive-green streaks around the eye, violet spots on sides of snout, first dorsal spotted and clouded with bluish; second dorsal pale yellowish with sky-blue spots; pectorals greenish. Small specimens yellowish in general colour have been seen.[49]

DISTINCTIONS: The gray triggerfish is readily distinguished from the queen triggerfish by the complete lateral line and the absence of radiating blue lines on the cheek.

SIZE: Up to a length of 19¼ inches (49 cm).[263]

RANGE: Both sides of the tropical Atlantic Ocean and in the Mediterranean, straying north as far as Cape Breton, Nova Scotia, in the western Atlantic, and to Ireland in the eastern Atlantic.

Canadian distribution: Occasional specimens have been reported. One was caught near Queensport, N.S., in September 1932.[498] One was caught 5 miles off Port Bickerton, N.S., and another at Rocky Bay, Richmond County, N.S., in 1956.[265] Specimens were caught in Halifax Harbour in 1910, 1937,[504] and in 1950, the latter specimens being preserved at the Biological Station, St. Andrews, N.B. Another specimen from 15 miles southeast of the entrance to Halifax Harbour caught in September 1957 is also preserved at St. Andrews. Offshore the triggerfish has been reported from Banquereau,[91] and from 24 miles SE X S from Sable Island in July 1931.[135]

Queen triggerfish — Baliste vieille

Balistes vetula Linnaeus 1758

The Annual Report of the Fisheries Research Board for 1953 carried a report of a specimen of this species caught off the Nova Scotian banks and identified by Dr. W. J. Dyer, Halifax Technological Station. The queen triggerfish is so strikingly coloured that misidentification seems unlikely. It has not been recorded for the Gulf of Maine.

Family OSTRACIONTIDAE — Boxfishes or trunkfishes

These small fishes are encased in a bony shell or box formed by the fusion of the scales, only the caudal peduncle is free and flexible. They are slow-moving fishes, having sacrificed speed for armour and, like the other members of the order, are essentially tropical species, occasionally wandering northward, or carried there by ocean currents.

Trunkfish — Coffre tuberculé

Lactophrys trigonus (Linnaeus) 1758

The trunkfish, *Lactophrys trigonus* has been unofficially reported from a specimen landed at Halifax. This is a tropical and subtropical species reported to occur as far north as Massachusetts along the Atlantic coast, although it has not been reported for the Gulf of Maine. An occurrence in our area would be most unusual.

Family TETRAODONTIDAE Puffers, globefishes, or swellfishes

These are small, stout-bodied marine fishes, having the peculiar quality of being able to inflate a sac-like expansion of the gullet to the extent of making the fish almost or quite spherical, a defence mechanism. The mouth is small and the teeth are fused and beak-like, although a median suture is visible in both upper and lower jaws.

These are tropical species that occasionally wander far northward.

KEY to Families TETRAODONTIDAE and DIODONTIDAE

1 Body covered with long, strong spines; teeth in each jaw fused together, beak-like (Diodontidae) .... Striped burrfish, *Chilomycterus schoepfi* (p. 416)

Body naked or with only small, scattered prickles; teeth in each jaw fused but separated into 2 parts by median suture (Tetraodontidae) 2

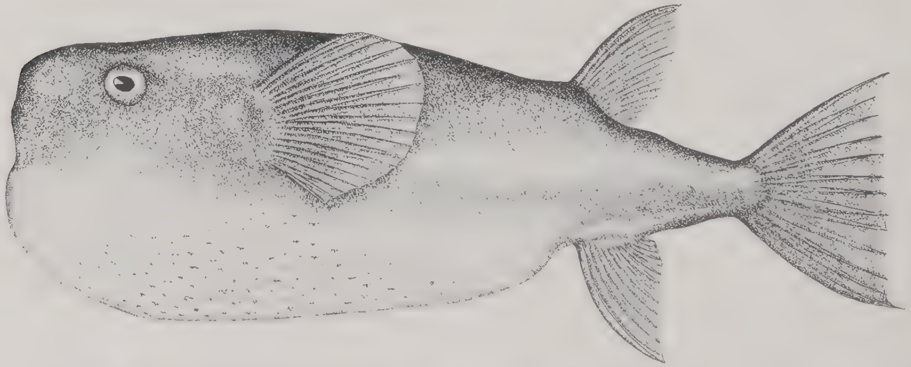
2 Soft dorsal fin rays 8; soft rays in anal fin 7; skin on anterior portions of head and body with fine prickles .. Northern puffer, *Sphoeroides maculatus* (p. 415)

Soft dorsal fin rays 15; soft rays in anal fin 14; strong, bony spines (with cross-shaped roots) on ventral surface .... Oceanic puffer, *Lagocephalus lagocephalus* (p. 414)

Oceanic puffer **Orbe étoilé**

Lagocephalus lagocephalus Linnaeus 1758

Dr. W. Templeman[471] reported a specimen 60 cm long collected alive on the beach at Point Verde, Placentia Bay, Newfoundland, on August 26, 1961. Point Verde is on the southeast coast, lat 47°14′N, long 54°01′W. The fish was reported to have been washed in by a heavy storm.



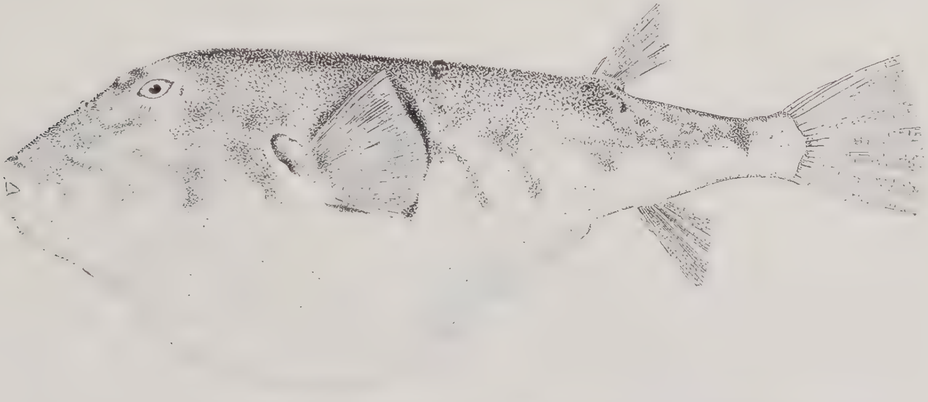
In his detailed account of the specimen, Templeman leaves no doubt of his identification -the large size, four-rooted cross-shaped bases for the skin spines, and the high dorsal (15) and anal (14) fin ray counts leave little room for doubt. The author further noted that, except for a record from Bermuda reported by Fowler,[141] there seemed to have been no other record for the West Atlantic region.

Northern puffer **Sphéroide du nord**

Sphoeroides maculatus (Bloch and Schneider) 1801

OTHER COMMON NAMES: swellfish, balloonfish, puffer

DESCRIPTION: Body, when not inflated, about 3 times as long as deep, rounded, tapering from region of base of pectoral fin to a rather slender caudal peduncle. Head 3½ in total length, bluntly pointed, upper profile straight, gill slit small, its length 1½ times horizontal diameter of eye, running obliquely downward and backward, somewhat above middle of side; mouth terminal, very small, no true teeth but bones of upper and lower jaws form cutting edges, each divided by a suture, giving appearance of 2 incisors above and below. Eye small, oval, horizontal diameter greatest, being 8 in head, situated high on head, near highest point of dorsal contour. Fins: dorsal (1) 8, second ray longest, length 2½ times greatest eye diameter, subsequent rays shorter, length of base of fin equals greatest eye diameter, located ⅔ of total body length from snout; caudal moderately large, rounded but with angular corners; anal 7, same shape and a trifle larger than dorsal, its origin under posterior part of dorsal; pectoral moderate, longest rays equalling length of longest dorsal rays, end rounded with angular corners, base located on middle of side, just behind lower end of gill slit; pelvics absent. Lateral line visible posteriorly. Head and body scaleless but all, except lower part of caudal peduncle, covered with small, stiff, closely-set prickles.



Colour, dark-olive above, somewhat marbled, sides greenish-yellow with 6–8 indefinite dark cross-bars; belly white.

DISTINCTIONS: The northern puffer when deflated resembles the triggerfishes and filefishes, but it lacks a dorsal spine and has much shorter soft dorsal and anal fins. It is not compressed as the filefishes are. Its gill slit although oblique slopes in the opposite direction to that of the triggerfish and filefish.

SIZE: Up to a length of 14 inches.

RANGE: The Atlantic coast of the United States from Florida to Cape Cod, straying to Maine, the Bay of Fundy, and southern Newfoundland.

Canadian distribution: Reported once from Hermitage Bay, Nfld.[11] A small specimen was caught in July 1951, near Kingsport, N.S., in Minas Basin.[265]

BIOLOGY AND ECONOMICS: Puffers are inshore fish that sometimes enter estuaries. They feed on small crustaceans, molluscs, marine worms, etc. South of Cape Cod, spawning occurs in late spring and early summer. The eggs are about $\frac{1}{30}$ inch in diameter; they adhere to objects on bottom. The puffer can inflate itself with air or water, if disturbed, until it becomes almost globular; it can deflate at will. Small fry under $\frac{1}{2}$ inch long can inflate themselves.[49, 520]

Family DIODONTIDAE Porcupinefishes

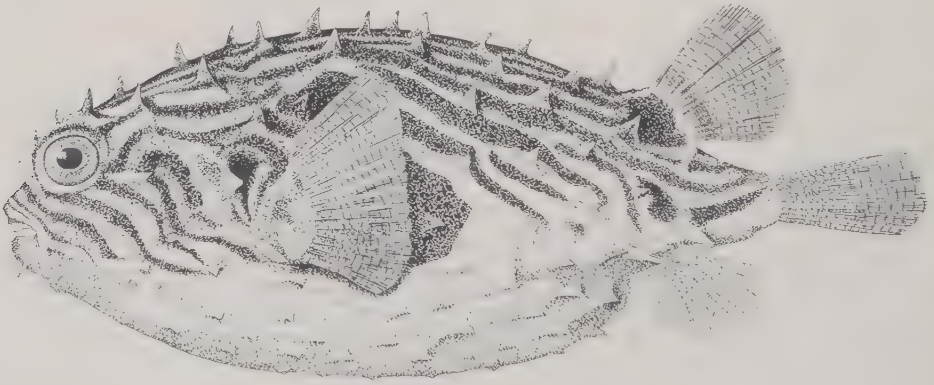
The porcupinefishes are close relatives of the swellfishes or puffers and resemble them in many structural features and in general habits. However, the porcupinefishes have a body covering of long, prominent bony spines, each with a 2- or 3-pronged root. They also have the ability to inflate themselves, causing them to appear rather like a spiny ball. They are further differentiated from the swellfishes by means of the fused teeth without median sutures in the upper and lower jaws. The teeth of the swellfishes have a distinct median suture.

Striped burrfish **Atinga barriolé**

Chilomycterus schoepfi (Walbaum) 1792

OTHER COMMON NAMES: porcupine fish, swellfish, burrfish

DESCRIPTION: Body oval, broad and slightly depressed, greatest depth $2\frac{3}{4}$ in total length occurring about middle of body, all contours rounded; caudal peduncle small; strong triangular spines sparsely scattered over entire head and body, length of upper ones $\frac{1}{2}$ eye diameter, those on belly smaller, 8–10 spines in any line from snout to tail. Head $3\frac{3}{4}$ in total length, profiles rounded, gill slit on mid-side, its length equal to eye diameter; openings of nostrils prolonged in a single tubular projection in front of line joining eyes; mouth terminal, small, angle in



front of eye, no true teeth, but bones of upper and lower jaws have cutting edges, no median sutures in these bones. Eye 4½ in head, located forward and high on head, space between eyes broad and concave. Fins: dorsal (1) 10–12, rounded, length of rays 2¼ times eye diameter, base of fin 1¼ times eye diameter, located far back on body just before caudal peduncle; caudal long, narrow, rounded; anal 10–12, under and similar in size and shape to dorsal; pectoral broad, end truncate with rounded corners, longest rays equal length of those of dorsal fin, base on mid-side a short distance behind gill slit; pelvics absent. No apparent lateral line.

Colour, background varies from green to olive to brown; belly pale. Back and sides irregularly striped with broad, brown to black lines, running backward and downward. Dark blotches below the dorsal, above the anal, and behind the pectoral fins; another spot above base of pectoral.

DISTINCTIONS: The striped burrfish is readily distinguished by its oval shape and covering of stout, triangular spines. It further differs from the puffer in having the eyes larger, round and placed forward on the head, and in having the anal fin directly under the dorsal, whereas that of the puffer is slightly behind; furthermore, the burrfish has no median suture in the bony plates of the mouth, the puffer has such a suture.

SIZE: Up to a length of 10 inches.

RANGE: Cape Cod to Florida on the eastern coast of the United States, most numerous from Carolina southward; occasionally straying to Maine and Nova Scotia.

Canadian distribution: A single record exists of a 3-inch specimen that was caught in deep water off Sambro, near Halifax, N.S., in the summer of 1896 or thereabouts.[352]

Family MOLIDAE Ocean sunfishes or headfishes

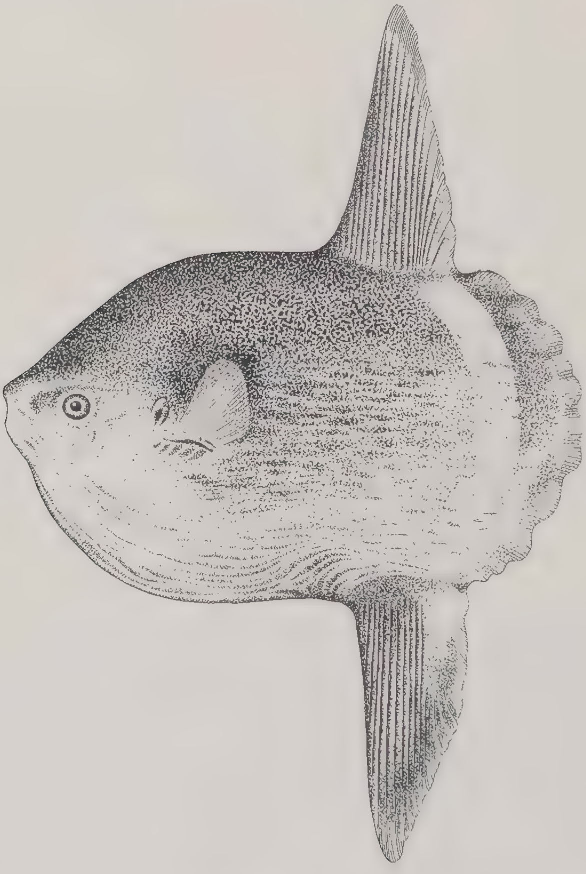
This is a small family of peculiarly shaped, pelagic fishes, usually found in warm seas. They present the appearance of being all head; there is a high dorsal and high anal fin and no caudal fin. Young ocean sunfishes look unlike the adults and are deeper-bodied but still lack the caudal fin. Instead of an abrupt leather-fringed termination to the body, the young have a row of spines.

One species occurs occasionally in our area.

Ocean sunfish Môle commun

Mola mola (Linnaeus) 1758

DESCRIPTION: Body ovate, short and deep, greatest depth 1⅔ in total length, compressed, about ¼ as thick as deep, little reduction of depth posteriorly, consequently there is no caudal peduncle; the general appearance is that of the head and fore-part of a large fish cut off behind the dorsal fin. Head 3½ in total length, upper and lower profiles steep, compressed; gill slit short, its length about equal to eye diameter, located on side approximately at eye level; mouth terminal, small, beak-like teeth completely united in each jaw, a nose-like pad overhanging upper jaw. Eye small, 6 in head, in line with mouth and about halfway between it and gill slit. Fins: dorsal (1) 15–18, forming a high triangle with 6th or 7th ray longest, equalling almost ½ of body length, base length equals ½ height of fin, located well behind level of pectoral fins; caudal short and thick, extending along whole posterior margin of body, looking more like a fold of skin than a typical fin, margin scalloped; anal 15–18, similar in size and shape to dorsal, under which it is located; pectorals relatively small, longest rays 3 times diameter of eye, base horizontal below and behind gill slit, so that fin is directed upward; pelvic fins absent. No lateral line. No scales; body is covered by a thick, tough, elastic skin, with a coating of small bony tubercles that give it the appearance of shark skin.



Colour, dark-gray above, sides grayish-brown with silvery reflections, belly dusky to dirty-white.

DISTINCTIONS: The ocean sunfish cannot be confused with any other species that occurs in Canadian waters. Its high dorsal and anal fins and "cut-off" appearance posteriorly, identify it at once.

SIZE: Sunfish up to almost 11 feet in length have been reported; one California specimen was slightly over 8 feet long and weighed 1800 pounds. Specimens over 5 feet long and 500 pounds are unusual.[49]

RANGE: The ocean sunfish occurs in tropical and temperate seas all over the world, both near shore and offshore. In the North Atlantic Ocean it occurs as far north as the Gulf of St. Lawrence and the outer coast of Newfoundland, in the west; and to northern Norway in the east.

Canadian distribution: Reported frequently in the Gulf of St. Lawrence. One was stranded at Curling, Bay of Islands, Nfld., in October 1926;[49] rare at Anticosti and one seen at Pointe des Monts, P.Q.;[405] at Metis Beach, P.Q., October 1949;[123] at Gaspé, P.Q.;[450] at Shediac, N.B., Cape Egmont and off Malpeque, P.E.I., and at Les Mechins, P.Q.;[320] at Bathurst Harbour, N.B.;[93] at the Magdalen Islands, P.Q.;[40] known at Cheticamp, N.S.,[95] and Cabot Strait.[20] It has been reported from Notre Dame Bay, Nfld., in September 1932.[17] Occasional at Canso, N.S.;[91] the M.V. *J. J. Cowie* harpooned a 300-pound specimen at Ketch Harbour, N.S., in September 1950. Occasionally landed at Halifax, N.S. The sunfish appears to be less frequent in the Bay of Fundy; reported from Saint John Harbour, N.B.;[93] a 500-pound specimen was caught at Chance Harbour, N.B., in August 1951.

BIOLOGY AND ECONOMICS: The ocean sunfish is a summer visitor both inshore and offshore in Canadian waters. While usually seen at the surface one was reported to have been caught by handline in 20 fathoms of water in the Gulf of Maine.[49]

A variety of food has been found in sunfish stomachs—jellyfish, comb-jellies, crustaceans, molluscs, and brittlestars;[49] two squid were found in the stomach of one that was landed at Canso, N.S.[91]

Order PEDICULATI (Lophiiformes)—ANGLERFISHES

The anglerfishes are generally short and stout-bodied, and are readily distinguished from other fishes since the first spine of the reduced spinous dorsal fin is located far forward, on top of the head. This spine which is called an illicium usually ends in a flap or tassel of tissue, and the whole structure is used as a line and bait; this first spine is modified in a variety of ways in the different groups.

Anglerfishes have small gill openings usually placed far back, the pelvic fins are thoracic when present and consist of a spine and 5 soft rays, the body is either naked or partially covered with small or large spines.

About 150 species are recognized, classified in three suborders and 15 families. Most are deep-sea dwellers moving about on the bottom, but at least one species is found among floating seaweeds or in tropical shore waters. Six species in five families have been reported from our area.

KEY to Species of Order PEDICULATI—Anglerfishes, Batfishes

1	Pelvic fins present	2
	Pelvic fins absent	4

2 Head and body laterally compressed; colour pale yellow and marbled .... Sargassumfish, *Histrio histrio* (p. 423)

Head and body depressed or flattened dorso-ventrally 3

3 Illicium (first dorsal spine on head) long and slender; skin naked .... Monkfish, *Lophius americanus* (p. 420)

Illicium in form of a short rostral tentacle, bony and covered with small bony tubercles .... Atlantic batfish, *Dibranchus atlanticus* (p. 424)

4 Body with large bony plates, each with a median spine, scattered over body, no caruncles on back .... Atlantic footballfish, *Himantolophus groenlandicus* (p. 426)

Body without large bony plates and with 2 or 3 caruncles on back 5

5 Back with 2 caruncles in front of soft dorsal fin on females, illicium long and slender; males without pigment on head or body .... Deepsea angler, *Ceratias holboelli* (p. 428)

Back with 3 caruncles in front of soft dorsal fin on females, illicium short; males with pigment on gill cover, back, and caudal peduncle .... Lesser deepsea angler, *Cryptopsaras couesi* (p. 429)

Suborder LOPHIOIDEA

Family LOPHIIDAE — Goosefishes

The Lophiidae is the only family in this suborder, whose members have the following characteristics: large heads, wide mouths with depressible or hinged, fang-like teeth, pelvic fins present and composed of one spine and five soft rays.

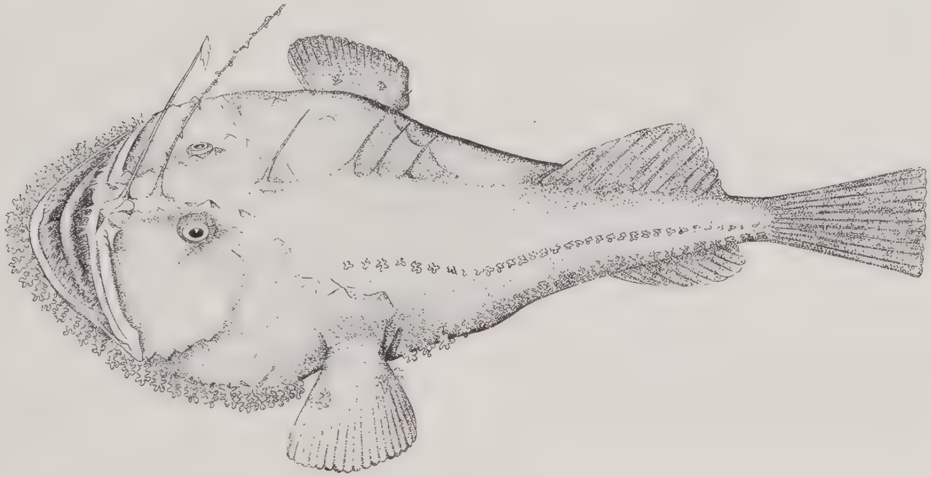
The family contains about 20 species all marine and some occurring in warm seas. One species is established in our area.

Monkfish — Baudroie d'Amérique

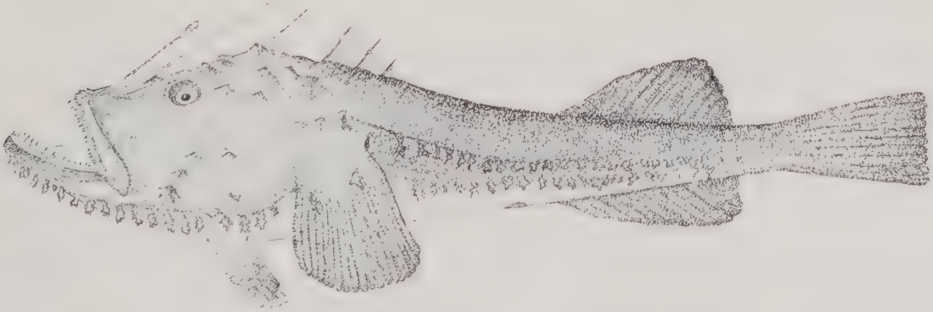
Lophius americanus Valenciennes 1873

OTHER COMMON NAMES: goosefish, angler, all-mouth, fishing frog, baudroie, diable de mer, poisson-pêcheur

DESCRIPTION: Body much depressed, greatest width about 3 in total length occurring at level of pectoral fins, behind this the body tapers uniformly to a small, cylindrical caudal peduncle; body very soft, so that it partially collapses when removed from the water. Head very large, wider than trunk, depressed, about 2½ in total length, front contour rounded, several low, conical tubercles on top of head, near inner edge of eyes and behind them; mouth very large, almost as wide as head, terminal, lower jaw extending considerably beyond upper, both jaws armed with a row of large, irregular, canine-like teeth, that are mostly depressible; vomer and palatines with strong teeth. Gill openings behind pectoral fins in lower axil of fin. Eye, small, about 10 in head, located on top of head, and directed upward. Fins: dorsals (2) 1st I-I-I–III, the spines widely separated, the first 3 on top of head and not connected by membrane, the other 3 slightly behind the bases of the pectoral fins and connected by thin membranes, all these spines slender but stiff, the first spine is located a short distance behind the tip of the upper jaw, is about ¼ as long as head, bearing at its end a fleshy tab, the "lure" 2nd spine as long or longer than 1st, located just in front of eye level, these 2 spines depressible,



3rd spine ½ as long as first 2, located just in advance of a line joining bases of pectorals, last 3 spines progressively shorter, 2nd dorsal 10–11, middle rays longest, about equal to length of 3rd spine, base of fin 2½ times as long as high, located nearer caudal than pectorals; caudal moderate, but thick, truncate, making entire fin broom-shaped; anal 9–10, thick, begins under middle of 2nd dorsal and ends behind termination of dorsal, and a little lower and



shorter than 2nd dorsal; pectorals heavy, fleshy, the bases somewhat arm-like, ends scalloped and rounded, located on sides of body about ⅓ of body length from front of mouth; pelvics also heavy, situated on lower surface of head, well in front of pectorals. Skin scaleless, smooth and slippery, a series of branched fleshy fringes or tabs along edge of lower jaw, extending back on sides of head almost to base of pectorals; 2 rows of similar, but smaller, tabs from above and behind pectoral fins to end of caudal peduncle; a few similar tabs on pectoral fins.

Colour, brownish above, with fine dark mottling; belly dirty-white; dorsal, caudal, and pectoral fins are a darker shade of the colour on the back and are almost black at the tips; pelvic fins reddish.

Distinctions: The monkfish or goosefish has such an unusual appearance that it is easily recognized. The depressed form, enormous mouth, erectile spines on the head, and the somewhat arm-like pectoral fins are sufficiently distinctive. The sea raven is the only inhabitant of northern seas that remotely resembles it and the sea raven is deeper than broad and has extensive gill slits, while the monkfish has small gill openings only.

Size: Up to 4 feet in length and a weight of 50–60 pounds.

Range: Eastern coast of North America from the northern Gulf of St. Lawrence south to North Carolina in shoal and deep water; in deep water only off Barbados, in the Gulf of Mexico and off Brazil.[49] Some doubt exists about the species that occurs in these tropical waters. A similar species occurs in Europe from the Faroes and Norway southward, and in the South Atlantic Ocean to the Cape of Good Hope.

Canadian distribution: In the northern Gulf of St. Lawrence the monkfish has been reported from Long Point and Anse des Dunes, near Mingan, P.Q.[130] and from Great Mecatina Island at lat 50°48′N, long 58°52′W.[267] It is listed for Gaspé, P.Q.;[450] Chaleur Bay at Bathurst, N.B.;[88] Miramichi estuary;[93, 312] Tignish, P.E.I.;[92] midway between Bird Rocks and Cape Anguille, Nfld.;[454] at Gros Cap, Magdalen Islands, P.Q.;[40] and was known by fishermen at Cheticamp, N.S.[95] Common off Canso, N.S.;[91] in coastal waters generally and on the banks off Nova Scotia;[102, 513] southern and northeast edges of the Grand Bank.[17, 18, 19] Taken in moderate numbers throughout the Bay of Fundy and in St. Mary Bay; in Annapolis and Minas basins.[205]

Biology and Economics: The monkfish is a bottom fish occupying a great range of depths up to 365 fathoms. It tolerates a wide range of temperature, from 32 to 70 F, although there is some indication of movement into deeper water when surface waters become warm.

The monkfish spawns from June to September in Canadian waters. The eggs are about $\frac{1}{16}$ inch in diameter, and they have one or more straw-coloured to pinkish oil globules. The most extraordinary feature of monkfish spawn is that the eggs are laid in a mucous sheet or veil that floats at the surface and may be 30–40 feet long by a foot or more in width. Such a sheet, the product of one female, may fill a tub to overflowing and may contain up to $1\frac{1}{3}$ million eggs; veils with 3 million eggs have been found. The sheet has a slight purple colour.

The eggs hatch in 1–3 weeks, and fry with curiously elongated dorsal head spines and pelvic fins result. The eggs will develop over a wide temperature range.[41] Young stages have been found near Sambro Bank,[102] on Sable Island Bank, and the northeastern edge of Grand Bank;[17, 19] also near Brazil Rock, off southern Nova Scotia.[89]

Monkfish may reach a length of 2½ inches before the first winter and 4½ inches when a little over a year old. Otolith studies indicate that 30-inch fish are 9 years old, and that 40 inch ones are 12 years old.[88]

A wide variety of fish is eaten by the monkfish including herring, sand lance, alewives, menhaden, smelt, haddock, mackerel, cunner, striped bass, sculpins, sea ravens, flounders, and skates. Salmon and shad have been found in their stomachs, but only when the fish were taken from a weir where they had been confined in a limited space. In the open sea such capture would be unlikely. The monkfish has been observed lying in wait with the lure on the first dorsal spine exposed and acting as bait for unwary fish. Many invertebrates, such as crabs, squid, other molluscs, starfish, and marine worms, are eaten as well, and even sea birds have been found in their stomachs.

Although several million pounds of monkfish are consumed annually as food in Europe (of a closely related species), no similar development has occurred on this continent. As trash fish from trawler catches they are used in fish meal production. The well-developed lower jaws with their large complement of teeth are frequently found along coastal beaches.

Suborder ANTENNARIOIDEA

The fishes of this suborder are generally small and have small mouths (in contrast to large mouths of the lophioid fishes), and most have a prickly skin.

The suborder is represented in Canadian waters by two families.

Family ANTENNARIIDAE — Frogfishes

These are small, somewhat compressed fishes, having three fin rays on the head. The pectoral fins are well developed, somewhat resembling arms, pelvic fins present and jugular in position. They are colourful creatures, often living on or among floating seaweeds.

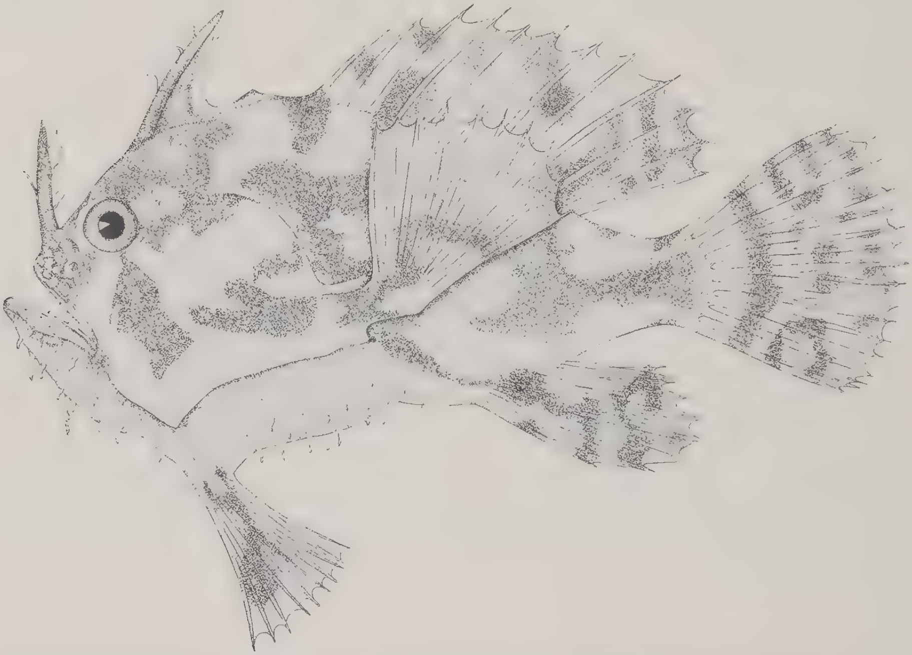
Only one species has been reported from our area.

Sargassumfish **Sargassier**

Histrio histrio (Linnaeus) 1758

The sargassumfish is a warm-water species characteristically found associated with floating seaweeds. Bigelow and Schroeder[49] report two specimens taken off

Georges Bank, one in 1930 and one in 1937. In the collection at the Biological Station, St. Andrews, N.B., is a specimen collected by dip net at the surface at



lat 43°18′N, long 55°50′W. This is possibly the northernmost reported occurrence for the species in the Atlantic waters of North America.

Family OGCOCEPHALIDAE — Batfishes

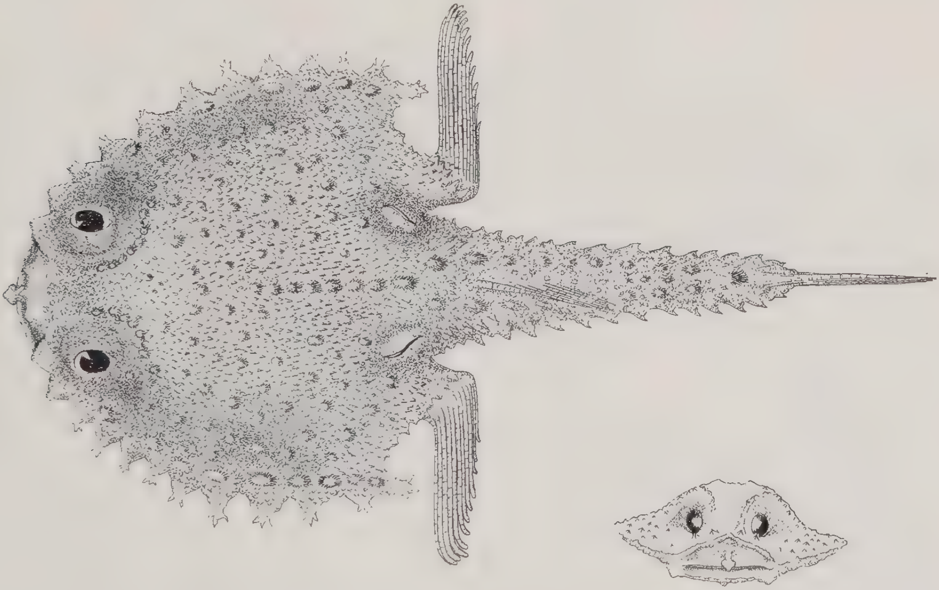
The batfishes are small fishes of bizarre appearance. The fore body and head are broad and depressed, the snout somewhat elevated, the spinous dorsal reduced to a small rostral tentacle, pelvics present and thoracic, and the head and body covered with small bony tubercles or spines. The batfishes are deep-water, bottom-dwelling forms, widely distributed in the oceans of the world.

Only one species has been reported from our area.

Atlantic batfish — Chauve-souris atlantique

Dibranchus atlanticus Peters 1875

DESCRIPTION: Body consists of an orbicular disc with a much narrower, but quite stout, tapering tail, the disc slightly under half the total length, disc much depressed, its edges produced laterally along the margin by about 28 triangular projections that bear needle-shaped spines surmounting these projections in groups of 2 or 3; largest projection is the posterior one, that almost equals eye diameter in length and which is directed backward; similar, but smaller, projections on the tail. Head large, merged with body, also much depressed; on the under side of the head, but above mouth, there is a cavity containing a barbel, that is thick and club-shaped; mouth terminal, horizontal and wide, its width equal to the distance between the pupils of eyes, lower jaw convex, teeth in cardiform bands on jaws, none on vomer or palatines. Eyes large, situated on upper surface of head, near snout, distance between them 1½ times their own diameter. Fins: dorsal (1) 6–7, 3rd ray longest, being 6 in total body length, inserted on tail portion of body a short distance behind the disc; caudal rounded; anal 4, 3rd ray about as long as 3rd ray of dorsal, inserted behind dorsal; pectorals with protruding arm-like bases 13–15, 3rd or 4th rays longest, being 4⅔ in total length, fins directed at right angles to main axis of body; pelvics inserted near middle of underside of disc, a little nearer to vent than to front of mouth, with 1 rudimentary and 5 well-developed rays, last ray longest. Body covered above with numerous stout conical spines with star-shaped bases, these largest on tail where they are arranged in about 4 irregular longitudinal rows, on each side of the dorsal fin; closely set rows of these stout spines mark the outer margin of the disc.



Colour, reddish-grey or grey-brown above, slightly lighter below. Rees[376] notes that fin colour varied from white to brilliant rose-red and eye colour from black to blue and green.

DISTINCTIONS: This batfish is unlikely to be confused with any other species occurring in this region. The large posterior projection on each side of the disc differentiates it from related genera that have a more rounded disc. The pectoral fins are directed laterally producing a crouching effect. The very strong prickles and the absence of teeth on the vomer and palatines are further distinctive characters.

SIZE: Up to a length of 5½ inches.

RANGE: Deep waters of the Atlantic Ocean; quite abundant in about 300 fathoms; known from the west coast of Africa; off Cape Verdes; off Barbados and north in the Gulf Stream to Newport. Many records from the region of lat 40°N, long 70°–71°W.[170]

Canadian distribution: A 5½-inch specimen was landed by a dragger at Gaultois on the south coast of Newfoundland in May 1955 and was presumed to have been caught in the Laurentian Channel near St. Pierre Bank.[10] Schroeder's[414] report suggested that the species was not uncommon from the southern Nova Scotia banks southward in depths of 150–500 fathoms. The earliest record for our area resulted from the *Michael Sars* 1910 expedition; a specimen was taken near the southern tip of Grand Bank and reported by Koefoed.[248] Rees[376] has presented data on 16 additional captures by the *A. T. Cameron* in the Canadian area. Rees' work indicates that the Atlantic batfish is restricted to the edge of the continental shelf, that it does not venture far into the deep channels cutting into the shelf, and also that it is more common on the Scotian Banks than the Grand Bank.

Suborder CERATIOIDEA—Ceratioid anglerfishes

These are short, stout-bodied fishes in which the modified first dorsal spine, called the illicium, is most highly developed and the pelvic fin is absent. Sexual dimorphism is marked in this group, the males being reduced in size and parasitic upon the females. The males do not develop an illicium. Identification of species is difficult because the individuals pass through larval stages and because of the sexual dimorphism. For further information see Bertelsen.[43]

Ten or 11 families and about 120 species are currently recognized. Three species in two families are known to occur in our area.

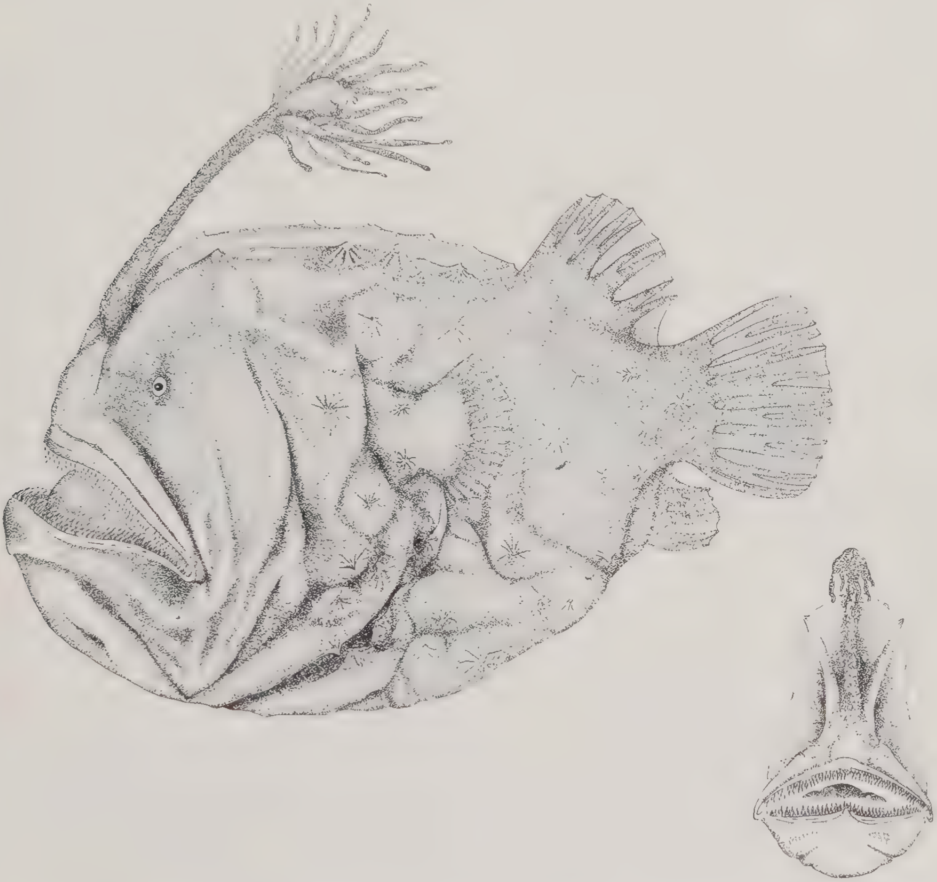
Family HIMANTOLOPHIDAE Footballfishes

These are globoid-shaped fishes without caruncles on the back (family Ceratiidae have 2 or 3), the bodies of females with a few large bony plates, each with a median spine, the skin of the males with small spines.

Atlantic footballfish **Football atlantique**

Himantolophus groenlandicus Reinhardt 1837

DESCRIPTION: *Females*—Body ovate, greatest depth 1⅗ in total length, occurring somewhat before pectoral fin, somewhat compressed; a short, heavy caudal peduncle. Head scarcely distinguishable from body, profile very steep, gill slit small and below base of pectoral fin; a long, stout tentacle (illicium) with a club-shaped end arises from the dorsal midline above the eye, its total length including filaments about ½ that of body, 8 or 9 branching filaments near its outer end and 2 short, hand-like structures on the end of the club; mouth moderate, oblique, angle under eye, 3–5 series of sharp, depressible teeth in the jaws, the inner ones largest, no teeth on vomer. Eye very small, normal in position. Fins: dorsal (1) 5, all but first ray bifid at end, fin fleshy, set far back on body near caudal peduncle, height and base length equal and about 6½ in total length; caudal moderately heavy, rays, except first and last, bifid at tip, fin rounded; anal 4, last 2 rays bifid, smaller than dorsal, located under it; pectorals moderate. rounded; anal (1) 4, last 2 rays bifid, smaller than dorsal, located under it; pectorals moderate, about 16–17 rays, length about 9 in total length, end rounded, base halfway between snout and tip of caudal, on midside, above and slightly in front of the small gill slit; pelvics absent. Skin with some large, rounded, bony plates, each bearing a median spine. *Males* —Free-living, more elongate than females, they lack teeth in the jaws, except when young, and have no illicium; always small.



Colour, blackish, young specimens brownish; tips of illicium and tentacles whitish, probably luminous.[377]

DISTINCTIONS: This species is distinguished from *Ceratias* by the absence of caruncles on the back; these are present in *Ceratias*. The illicium is much shorter and stouter in *Himantolophus* than in *Ceratias*. The high, compressed form distinguishes it from the strongly depressed monkfish.

SIZE: Females up to a length of 23½ inches; males 2 inches.[43]

RANGE: North Atlantic from off Portugal to Greenland and Iceland; South Atlantic; Japan.[43, 377, 379] Fry have been taken over wide areas in the North and

South Atlantic, Caribbean, South Pacific, and Indian oceans, chiefly in the tropical portions, and from the surface to 600 fathoms.[43]

Canadian distribution: A single specimen was caught by the dragger *Blue Haze II* in 75–80 fathoms in February 1954 on the southwestern edge of the Grand Bank at lat 43°30′N, long 51°34′W.[9]

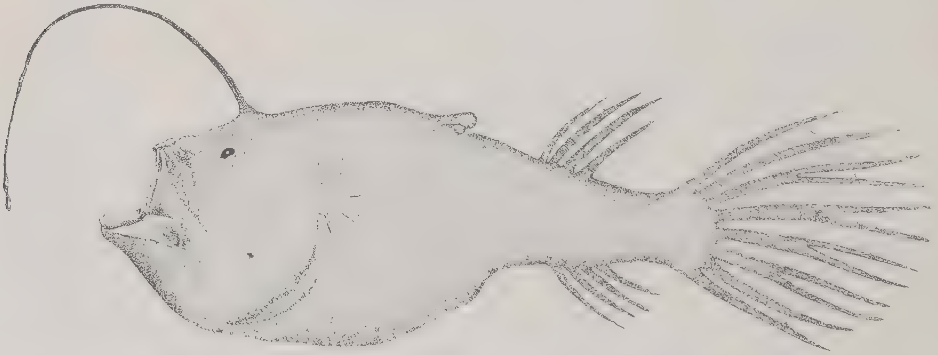
Family CERATIIDAE — Anglerfishes

In the fishes of this family the head and body are somewhat compressed, mouth moderate and at an oblique angle. In front of the soft dorsal fin are 2 or 3 rays modified to form caruncles (males and larvae without caruncles).

Deepsea angler — Grand pêcheur abyssal

Ceratias holboelli Krøyer 1844

Description: Sexes markedly different in form and size. Body of females soft, oblong, much compressed, greatest depth 3½ in total length, occurring at level of pectoral fin, posterior part of body decidedly less deep. Head about 3½ in total length, scarcely distinguishable from body; mouth almost terminal, nearly vertical, large; movable, conical teeth of moderate size in the jaws, no teeth on vomer and palatines. Gill slits very small, C-shaped, placed below the pectorals and a little behind them. Eyes very small, functional in young specimens, covered by skin in larger ones, placed high on head. Fins: dorsals (2) first I, a long, slender process, or tentacle, located on head, above eye, its length half that of body, ending in a fleshy, pear-shaped swelling, the illicium, this structure can be largely withdrawn into a tube in the body, bringing the bait (illicium) nearer the mouth, but when this occurs the basal bone protrudes from the back, giving the appearance of another dorsal tentacle;[13] behind this modified ray are a pair of low fleshy appendages, called "caruncles", that are considered to be vestiges of the 1st dorsal fin; 2nd dorsal 3–5, the rays thick and fleshy, separate, the longest rays about 2 in head, located far back on body; caudal moderately large, usually much subdivided; anal 4–5, thick fleshy rays, separate, about same length as 2nd dorsal, located under middle of 2nd dorsal and extending slightly farther back on body; pectorals small, located on middle of side; pelvics absent. Body covered with prickles, that become low, conical, broad-based thorns on large fish.



The males remain small and are free-living at first, but later become parasitic and fasten themselves to the ventral sides of the females. They receive sustenance from the blood of the females and lack teeth, eyes, the tentacle-like spine, and have only a rudimentary digestive tract. The skin is prickly, like that of the females.

Colour, jet black. The colourless prickles stand out to produce a granulated black and white appearance in large specimens.

DISTINCTIONS: The deepsea angler is distinguished by its unusual form and the presence of a tentacle, with an illicium, on top of the head. It differs from the monkfish in being compressed instead of depressed. It lacks the pelvic fins of the monkfish.

SIZE: Up to 47 inches in total length for females and to 6 inches for males.

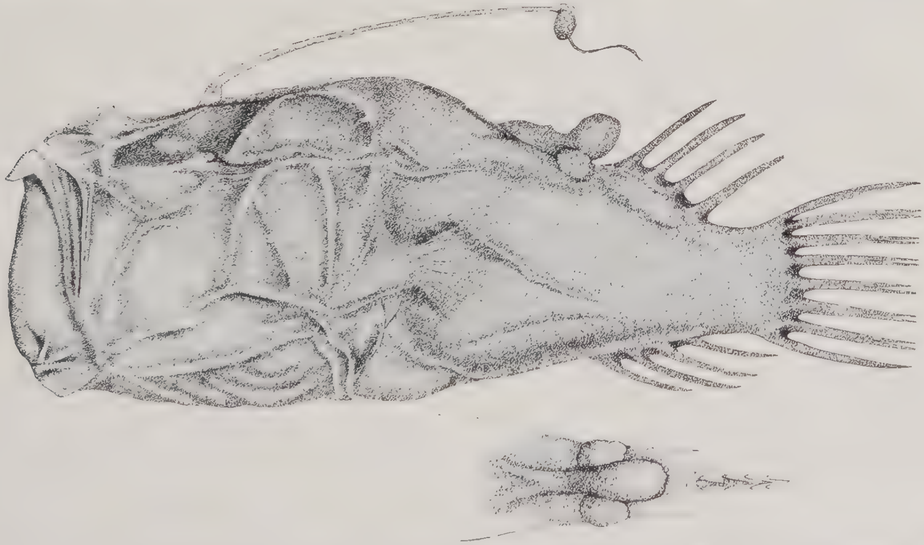
RANGE: Only about 200 specimens, mostly young, have been caught, but they have ranged widely and the species is cosmopolitan in deep water.[43] It has been taken off the east coast of Canada; in the Gulf of Maine; off Greenland and Iceland; near the Azores; in the Caribbean; from the south Atlantic Ocean and sub-Antarctic Seas; and in the Indo-Pacific Ocean.

Canadian distribution: A specimen that may have belonged to this species was reported off Nova Scotia,[198] and this may be the basis of a report by Goode and Bean.[170] A specimen 9½ inches long was caught by the trawler *Cape Spry* in the Gulf of St. Lawrence, east of Anticosti (lat 49°10′N, long 60°20′W) in 150 fathoms on July 7, 1958.[265]

Lesser deepsea angler — **Petit pêcheur abyssal**

Cryptopsaras couesi Gill 1883

In a list of fishes occurring in the Gulf of St. Lawrence, Bergeron[40] includes this species. Previous reports of its occurrence indicated that its range in the western Atlantic extended from about lat 50°N southward to lat 7°N.[177] Although the



species has been caught below 2000 metres (1093 fathoms), most specimens have been caught between 1700 metres (930 fathoms) and the surface.[177]

GLOSSARY OF TECHNICAL TERMS APPLIED TO FISHES

Abdomen—the lower surface of the body, especially the part between the pectoral fins and the anus.

Abdominal pelvic fins—said of pelvic fins when located on abdomen, far removed from head.

Abyssal—used in reference to the waters below 1500 fathoms.

Accessory caudal rays—short rays on the upper and lower anterior portions of the caudal peduncle.

Accessory pectoral scale—an enlarged or elongated scale at base of pectoral fin in some herring-like fishes.

Adipose fin—a fleshy fin on the back behind the dorsal fin as in salmons, smelts, and lanternfishes.

Air bladder—a sac filled with air or other gases lying beneath the backbone and either attached or not to the walls of the body cavity.

Ammocoetes—a name applied to the larval form of lampreys.

Amphicoelous—concave both before and behind, the usual condition of fish vertebrae.

Anadromous—ascending rivers from the sea to spawn, as do shad and some salmonid fishes.

Anal—referring to the anus or vent.

Anal fin—the fin on the median ventral line behind the anus.

Anal papilla—an appendage or protuberance in front of the genital pore and behind the vent in sculpins.

Anterior—the front portion: in front.

Anus—the posterior external opening of the alimentary canal: the vent.

Articulated—attached by means of a movable joint: jointed.

Asymmetrical—not symmetrical: one side not the mirror image of the other, as in the head of a flatfish or flounder.

Barbel—an elongated, hair-like projection, usually about the mouth, chin or nose, as in the cods and sturgeons.

Bathypelagic—inhabiting open waters below 200 fathoms.

Bifurcate—divided into two branches.

Branchial—of the gills.

Branchiostegals (or *branchiostegal rays)*—bony rays supporting the membranes which close the branchial or gill cavity.

Breast—see pectoral.

Buccal—of the mouth.

Caecum—a blind sac connected with the alimentary canal (plural-caeca).

Canines—conical teeth which are larger than the rest.

Carinate—keeled: having a sharp median ridge as on the belly of certain herring-like fishes.

Catadromous—going down rivers to the sea to spawn as does the American eel.

Caudal—pertaining to the tail or caudal fin.

Caudal peduncle—the fleshy end of the body behind the anal fin and before the caudal or tail fin: the tail minus the tail fin: (the "wrist").

Centrum—the body of a vertebra.

Chin—anterior ventral portion of the lower jaw.

Chondrocranium—the cartilaginous brain case in fishes around which covering bones are laid down in higher (bony) fishes.

Claspers—modified inner portions of the pelvic fins in sharks, rays, and chimaeras; used for sperm transfer to female.

Cloaca—a chamber in the lower part of the gut into which empty the ducts from the kidney and reproductive organs and having one external opening, cloacal aperture, instead of separate anal (vent) and urinogenital openings.

Compressed—laterally: flattened from side to side.

Ctenoid—said of scales of most spiny-rayed fishes having posterior margin of scale with teeth.

Cusp—a point or projection on a tooth.

Cycloid—said of the scales of typical soft-rayed fishes having smooth margins.

Deciduous—said of scales that are easily rubbed off and thus not firmly attached.

Dentary—a bony element of the lower jaw usually bearing teeth.

Dentate—with tooth-like notches.

Dentition—said of teeth, their arrangement and structure.

Depressed—flattened from above downwards, i.e. dorsoventrally as in skates.

Depth—the vertical diameter or distance through, as of the body of fishes.

Distal—farthest from the centre; peripheral.

Dorsal—pertaining to the back.

Dorsal fin—the fin on the back, usually central in position.

Emarginate—said of caudal fin having a slight, shallow notch at the tip.

Euryhaline—able to tolerate a wide range of osmotic pressures in the environment; a fish that can move freely from a salt to a freshwater environment.

Falcate—scythe-shaped.

Falciform—see falcate.

Fauna—the assemblage of animals inhabiting a region.

Filament—slender or thread-like, said of certain elongated fin rays in some fishes.

Filamentous—see filament.

Fulcra—spine-like structures bordering the anterior rays of the fins in lepidosteid fishes (gars).

Fusiform—spindle-shaped; referring to the form of fishes which have the body tapering both anteriorly and posteriorly, and slightly or not at all compressed.

Gill arches—the bony supports of the gills.
Gill cover—see operculum.
Gill membranes—the thin wall of skin supported by the branchiostegals, and closing the gill-cavity below.
Gill rakers—a series of tooth-like bony structures placed along the anterior edge of the gill arches.
Graduated—regular or steady increase in length, as of the spines in the fins of some fishes.
Gular—bony plate or plates located behind the chin and between the sides of the lower jaw.

Haemal spine—the lower or ventral spine of a caudal vertebra.
Hermaphrodite—having both male and female reproductive organs in one body.
Heterocercal—unequally lobed; said of the tail or caudal fin of a fish where the upper lobe is larger than the lower, and in which the last few vertebrae of the vertebral column are bent upward.
Homocercal—equally lobed; said of the tail or caudal fin when upper and lower lobes are more or less equal, and the backbone or vertebral column ends at the middle of the base of the fin.
Hypurals—the expanded haemal spines of the posterior vertebrae.

Illicium—modified fin ray located on head of anglerfishes and relatives; the "fishing rod" of anglerfishes.
Imbricated—overlapping, like shingles on a roof.
Inferior—used in reference to mouth when snout projects beyond lower jaw.
Infraoral—below the mouth; used in reference to the teeth of the mouth immediately below the oesophageal opening in lampreys.
Insertion—of a fin—the posterior end of the base, the part of the base farthest from the head; of pectoral and pelvic fins, the line along which the fin is attached to the body.
Interneurals—the bones to which the dorsal fin rays are attached.
Interopercle—a bone of the lower part of side of the head; a part of the operculum.
Interorbital space—narrowest distance across the head, between the bony edges of the orbits or eye sockets.
Isocercal—with the vertebrae becoming progressively smaller backward, as in the codfishes.
Isospondylous—with the anterior vertebrae simple; said of the herring-like fishes which lack the Weberian apparatus (a complex of 4 fused anterior vertebrae found in the suckers, carps, and catfishes).
Isthmus—the fleshy interspace beneath the head and between the gill-openings.

Jugular—pertaining to the throat; said of the pelvic fins when located in advance of the point of attachment of the pectorals.

Keeled—see carinate.

Larva—the young of an animal when differing markedly from the adult.
Lateral line—series of pore-like openings (to sensory canal) along the sides of a fish.
Laterally compressed—flattened from side to side.
Leptocephalus—a name applied to the larval form of the eels.
Lingual—pertaining to the tongue.
Lingual teeth—teeth on tongue: the serrated teeth on the tongue of lampreys.
Luminous organ—an organ that produces light, usually on abdomen or head, as in lanternfishes.
Lunate—crescent-like, in reference to shape of caudal or tail-fin.

Mandible—the lower jaw.
Maxillary—the posterior element of the upper jaw.
Molar—with a flattened, grinding surface; said of teeth.
Mouth—*inferior*—mouth below snout, snout obviously overhanging mouth.
  oblique—line of the mouth (when closed) at an angle of 45° or greater;
  subterminal—mouth slightly overhung by snout, not quite terminal:
  terminal—tips of upper and lower jaw forming foremost part of the head:
  ventral—mouth on ventral surface of head as in sturgeons.
Myotome—a muscle plate, a section of the repeated muscle units corresponding to the flakes of a cooked fish.

Nape—part of body immediately behind head on dorsal surface.
Nasal—one of the paired bones on front of a fish's head, usually beside the nostril.
Neural spine—the upper or dorsal spine of a vertebra.
Notochord—the embryonic cartilaginous vertebral column persistent in lampreys, sharks, and rays.
Nuptial tubercles—small often pimple-like projections that occur on head or body or lower fins of males of some species (i.e. American smelt) during breeding period.

Obsolete—only faintly apparent or absent.
Occiput—the extreme back of the head on dorsal surface.
Ocellus—an eye-like spot.
Oesophagus—the beginning of the digestive tract immediately after the mouth.
Opercle—the large rectangular bone of the gill cover.
Operculum—the bony covering of the gill cavity composed of opercular bones, i.e. preopercle, interopercle, subopercle, opercle; (also called gill cover).
Opercular flap—a backward prolongation of the posterior angle of the opercle.

Opercular gill—a rudimentary gill on the lower inner face of the operculum in gars and sturgeons.

Orbit—the bony eye socket.

Origin—of a fin—the anterior end of the base; the end of base nearest the head.

Oviparous—said of fishes that lay eggs which develop usually in the external environment.

Ovoviviparous—said of those animals that retain the eggs within the body of the female in a brood chamber in which the development of the embryo takes place, perhaps deriving some nourishment from the female, but without the strong umbilical attachment to a placenta as in mammals; the true condition of so-called 'live-bearing' fishes.

Palatine—a paired bone of the roof of the mouth.

Papilla—a small fleshy projection.

Papillose—covered with papillae.

Parietal—one of the roofing bones of the skull.

Pectinate—having teeth like a comb.

Pectoral —the anterior ventral portion of a fish (the breast).

Pectoral arch—shoulder girdle; the complex of bones usually connected with the skull, to which the pectoral fins are attached.

Pectoral fins—the most anterior or uppermost of the paired fins, usually dorsal to pelvic fins.

Pectoral girdle—see pectoral arch.

Peduncle—the fleshy end of the body behind anal fin (see caudal peduncle).

Pelagic—living in open waters, in contrast to bottom-living or inshore species.

Pelvic arch or girdle—the bones to which the pelvic fins are attached; pubic bones.

Pelvic axillary process—a slender scale-like process or tab of tissue that develops at the base of the pelvic fins of many salmonoid and other bony fishes.

Percomorph—used in reference to those fishes in the order Percomorphi and their highly specialized relatives.

Peritoneum—the membranous inner lining of the abdominal cavity.

Pharyngeal bones—bones behind the gills opposed to each other and usually armed with teeth, immediately before the oesophagus.

Photophore—an organ that produces light usually on belly or head, as in the lanternfishes.

Physostomous—having the air bladder connected to the oesophagus by an open duct.

Plankton—small aquatic plants and animals sometimes microscopic.

Plicate—with wrinkle-like folds.

Posterior—behind.

Prefrontal—a roofing bone of the skull, anterior.

Premaxillary—the paired bones usually bearing teeth that form the front of the upper jaw in trout-like fishes, and the entire border of the upper jaw in higher percomorph fishes.

Preopercle—the most anterior of the opercular series, the bone of the cheek.

Preorbital—a large bone lying in front of the eye.

Protractile—a term used in reference to the premaxillaries when they can be extended forward; such premaxillaries are separated from the sloping front of the head (forehead) by a groove.

Proximal—nearest the point of attachment.

Pyloric—used in reference to pylorus; that section of the intestinal tract immediately following the stomach.

Pyloric caeca—those caeca attached to the pyloric section of the digestive tract.

Ray—an articulated or jointed rod that supports the membrane of a fin.

Redd—the gravel nest of salmonid fishes.

Rostrum—a bony extension of the snout as in a swordfish.

Rudimentary—undeveloped.

Scute—a bony or horny plate.

Serrate—saw-toothed like a saw.

Shoulder girdle—the complex of bones usually connected with the skull, to which the pectoral fins are attached.

Snout—technically that part of the head of a fish in front of the eyes.

Soft dorsal—the dorsal fin or portion of it which consists of soft rays only.

Spine—fin rays which are not branched, are without obvious segments, and are more or less stiffened and sharpened at the apex.

Spinous dorsal—the dorsal fin or portion of it which consists of spines only.

Spiracle—an opening in the head anterior to and above the opercular opening representing a primitive gill-cleft, in lampreys, hagfishes, sharks, and rays.

Spiral valve—a spiral infolding (ridge) of the wall of the intestine.

Stenohaline—unable to tolerate a wide range of osmotic pressures in the environment; i.e. cannot move freely from salt to fresh water.

Subequal—nearly but not quite equal.

Subopercle—the bone below the opercle (see operculum).

Suborbitals—a series of small bones below the eye.

Supplemental maxillary—a small bone lying on the upper posterior edge of the maxillary.

Supraoccipital—the unpaired bone at the back of the skull usually with a crest above.

Supraoral—above the mouth.

Symphysis—the point of junction of two bones as in the two parts of the lower jaw in front: the tip of the chin.

Synonym—an additional scientific name for the same animal. When the same species is described by two different people and given different names, one of these will be retained and used, the other one is called a synonym. A list of disused names is called the synonymy of a species.

Teleost—a name applied to fishes having the skeleton fully ossified, in other words a "bony fish" in contrast to a shark which is a cartilaginous fish.

Terete—cylindrical and tapering.

Terminal—at the end.

Thoracic—pertaining to the chest or thorax; anterior to the abdomen.

Thoracic pelvic fins—pelvic fins which are attached far forward below the pectorals, the pelvic bones usually connected with the shoulder girdle.

Truncate—cut squarely off.

Tubercle—a soft or hardened lump or projection on the surface; usually a modified scale.

Tuberculate—covered with tubercles.

Urostyle—the last vertebral segment usually modified (pointed) and reduced.

Vent—the external opening of the alimentary canal, anus.

Ventral—on the lower surface; pertaining to the abdomen or belly.

Ventral fins—see pelvic fins.

Vermiculations—worm-track-like markings.

Vertebra—a single bone of the spinal column (plural—vertebrae).

Vertical fins—the fins (dorsal, anal, and caudal) on the median (centre) line of the body, in contrast to the paired fins (pectorals and pelvics).

Villiform—of the form of villi (finger-like projections); said of teeth which are slender and crowded closely together in bands.

Vomer—the anterior bone on the roof of the mouth.

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